United States
Department of
Agriculture

Soil
Conservation
Service

In cooperation with
United States Department
of Agriculture, Forest
Service, and the Missouri
Agricultural Experiment
Station

Soil Survey of Iron County, Missouri

How To Use This Soil Survey

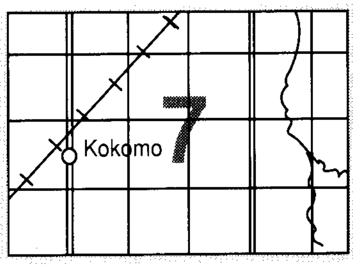
General Soil Map

The general soil map, which is the color map preceding the detailed soil maps, shows the survey area divided into groups of associated soils called general soil map units. This map is useful in planning the use and management of large areas.

To find information about your area of interest, locate that area on the map, identify the name of the map unit in the area on the color-coded map legend, then refer to the section **General Soil Map Units** for a general description of the soils in your area.

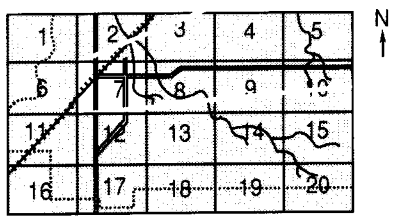
Detailed Soil Maps

The detailed soil maps follow the general soil map. These maps can be useful in planning the use and management of small areas.



MAP SHEET

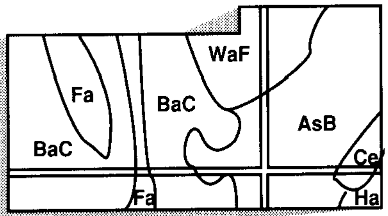
To find information about your area of interest, locate that area on the **Index to Map Sheets**, which precedes the soil maps. Note the number of the map sheet, and turn to that sheet.



INDEX TO MAP SHEETS

Locate your area of interest on the map sheet. Note the map unit symbols that are in that area. Turn to the **Index to Map Units** (see Contents), which lists the map units by symbol and name and shows the page where each map unit is described.

MAP SHEET



AREA OF INTEREST

NOTE: Map unit symbols in a soil survey may consist only of numbers or letters, or they may be a combination of numbers and letters.

The **Summary of Tables** shows which table has data on a specific land use for each detailed soil map unit. See **Contents** for sections of this publication that may address your specific needs.

This soil survey is a publication of the National Cooperative Soil Survey, a joint effort of the United States Department of Agriculture and other federal agencies, state agencies including the Missouri Agricultural Experiment Station, and local agencies. The Soil Conservation Service has leadership for the federal part of the National Cooperative Soil Survey.

Major fieldwork for this soil survey was completed in 1987. Soil names and descriptions were approved in 1988. Unless otherwise indicated, statements in this publication refer to conditions in the survey area in 1987. This survey was made cooperatively by the Soil Conservation Service, the Forest Service, and the Missouri Agricultural Experiment Station. It is part of the technical assistance furnished to the Iron County Soil and Water Conservation District.

Soil maps in this survey may be copied without permission. Enlargement of these maps, however, could cause misunderstanding of the detail of mapping. If enlarged, maps do not show the small areas of contrasting soils that could have been shown at a larger scale.

All programs and services of the Soil Conservation Service are offered on a nondiscriminatory basis, without regard to race, color, national origin, religion, sex, age, marital status, or handicap.

Cover: An area where the steep, rugged slopes of Buford Mountain form a backdrop for gently rolling pastures in Belleview Valley.

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Issued February 1991

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Foreword

This soil survey contains information that can be used in land-planning programs in Iron County. It contains predictions of soil behavior for selected land uses. The survey also highlights limitations and hazards inherent in the soil, improvements needed to overcome the limitations, and the impact of selected land uses on the environment.

This soil survey is designed for many different users. Farmers, foresters, and agronomists can use it to evaluate the potential of the soil and the management needed for maximum food and fiber production. Planners, community officials, engineers, developers, builders, and home buyers can use the survey to plan land use, select sites for construction, and identify special practices needed to ensure proper performance. Conservationists, teachers, students, and specialists in recreation, wildlife management, waste disposal, and pollution control can use the survey to help them understand, protect, and enhance the environment.

Great differences in soil properties can occur within short distances. Some soils are seasonally wet or subject to flooding. Some are shallow over bedrock. Some are too unstable to be used as a foundation for buildings or roads. Clayey or wet soils are poorly suited to use as septic tank absorption fields. A high water table makes a soil poorly suited to basements or underground installations.

These and many other soil properties that affect land use are described in this soil survey. Broad areas of soils are shown on the general soil map. The location of each soil is shown on the detailed soil maps. Each soil in the survey area is described. Information on specific uses is given for each soil. Help in using this publication and additional information are available at the local office of the Soil Conservation Service or the Cooperative Extension Service.

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Soil Survey of Iron County, Missouri

By Burton L. Brown and Kenneth L. Gregg, Soil Conservation Service

Fieldwork by Burton L. Brown, Kenneth L. Gregg, and James D. Childress,
Soil Conservation Service

United States Department of Agriculture, Soil Conservation Service and Forest Service,
in cooperation with the Missouri Agricultural Experiment Station

IRON COUNTY is in the southeastern part of Missouri, about 55 miles south of St. Louis and 40 miles west of the Mississippi River (fig. 1). It straddles the St. Francois Mountains. It is bordered on the east by St. Francois and Madison Counties, on the south by Wayne and Reynolds Counties, on the west by Dent County, and on the north by Crawford and Washington Counties. The total area of the county is 353,421 acres, or approximately 552 square miles. Arcadia, Ironton, and Pilot Knob are the largest urban areas in the county. Ironton is the county seat. The population of the county was 10,999 in 1982.

Figure 1.—Location of Iron County in Missouri.

General Nature of the County

This section gives general information concerning the county. It describes climate; history and development; transportation facilities; farming; and physiography, relief, and drainage.

Climate

Prepared by the National Climatic Data Center, Asheville, North Carolina.

Iron County is hot in summer, especially at low elevations, and moderately cool in winter, especially on mountains and high hills. Rainfall is fairly heavy and well distributed throughout the year. Snow falls nearly every winter, but the snow cover lasts only a few days.

Table 1 gives data on temperature and precipitation for the survey area as recorded at Arcadia, Missouri, in the period 1951 to 1984. Table 2 shows probable dates of the first freeze in fall and the last freeze in spring. Table 3 provides data on length of the growing season.

In winter, the average temperature is 35 degrees F and the average daily minimum temperature is 24 degrees. The lowest temperature on record, which occurred at Arcadia on January 17, 1977, is -20

degrees. In summer, the average temperature is 75 degrees and the average daily maximum temperature is 88 degrees. The highest recorded temperature, which occurred on July 15, 1980, is 110 degrees.

Growing degree days, shown in table 1, are equivalent to "heat units." During the month, growing degree days accumulate by the amount that the average temperature each day exceeds a base temperature (50 degrees F). The normal monthly accumulation is used to schedule single or successive plantings of a crop between the last freeze in spring and the first freeze in fall.

The total annual precipitation is about 44 inches. Of this, nearly 25 inches, or about 55 percent, usually falls in April through September. The growing season for most crops falls within this period. In 2 years out of 10, the rainfall in April through September is less than 19 inches. The heaviest 1-day rainfall during the period of record was 6.97 inches at Arcadia on June 30, 1957. Thunderstorms occur on about 46 days each year.

The average seasonal snowfall is about 13 inches. The greatest snow depth at any one time during the period of record was 15 inches. On the average, 9 days have at least 1 inch of snow on the ground, but the number of such days varies greatly from year to year. Tornadoes and severe thunderstorms occur occasionally but are local in extent and of short duration. They cause damage in scattered small areas. Hailstorms sometimes occur in scattered small areas during the warmer part of the year.

The average relative humidity in midafternoon is about 60 percent. Humidity is higher at night, and the average at dawn is about 85 percent. The sun shines 65 percent of the time possible in summer and 50 percent in winter. The prevailing wind is from the south. Average windspeed is highest, 12 miles per hour, in spring.

History and Development

Evidence of campsites and artifacts testify to the presettlement presence of early man in the survey area. Early travelers and settlers encountered Indians in the area. Sac, Delaware, Osage, and Kickapoo Indians lived or hunted in Belleview Valley until about 1832 *(17)*. The Delaware Indians called the upper part of Stout Creek Valley the "lost cove." Evidence of dwelling sites is most prevalent on Secesh soils on stream terraces and on Courtois, Crider, and Lamotte soils in the valleys.

Iron County was formed from parts of St. Francois, Madison, Washington, Dent, Reynolds, and Wayne Counties by an act of the state legislature in 1857. The names of the county and of the county seat are derived from the principal mineral in the area. The first iron manufactured west of the Mississippi River was produced in the survey area as early as 1820 *(13)*.

The first settler in the survey area was William Reed, who received permission from the Spanish Commandant in 1796 to settle in Belleview Valley (originally spelled "Bellevue"). Early residents of "Mine a Breton," now known as Potosi, were familiar with the valley area even before its settlement, and early entrance into the area was from there. About 20 families already lived in Belleview Valley in 1805, when Ephraim Stout, from Tennessee, built a log cabin in an area in Arcadia Valley close to the creek that bears his name. The population grew slowly and concentrated in these two valleys. When organized in 1857, the county had only two villages within its borders. Arcadia was laid out in 1849 and Middlebrook in 1856. A village was established around the mining operation at Pilot Knob, but at the time it was apparently unnamed. Ironton was laid out when Iron County was organized, and it was selected as the county seat. The early settlers chose the same soils to build on as their predecessors. William Reed built his cabin on Crider soils, and Ephraim Stout chose the well drained Secesh soils on terraces.

The population generally has increased steadily since the first settlement. In 1804, a total of 20 families lived in the survey area. They probably were made up of fewer than 100 people. By 1860, Arcadia, Ironton, and Pilot Knob had become the population centers of the county. The three towns had a population of about 1,200. The entire county had a population of only about 2,000. The population was 8,716 in 1900 and peaked at 11,084 in 1980.

The economy of the county has been dependent on farming in the Belleview Valley and closely associated with mining and commerce elsewhere. The Iron Mountain Mining Company began manufacturing pig iron in 1846, and two iron-smelting furnaces were constructed at the base of Pilot Knob in 1847. For a brief period in 1860, marble was quarried along Marble Creek and in an area 3 miles west of Ironton. Red granite has been quarried in the county from time to time since 1868. Lead ore was discovered and mined near Des Arc in 1868. The Annapolis mine was a significant lead producer from 1915 to 1931. After the discovery of Viburnum Trend ore deposits in 1955, Iron County became part of a major lead district. These deposits contained the largest known reserves of lead and zinc in the United States.

Transportation Facilities

Early travel into what is now Iron County was mainly from Mine a Breton. In 1814, a court in Washington County ordered that a road be built between Mine a Breton and Belleview Valley. This was probably the first road into the area. In 1851, a plank road was constructed to transport iron ore from Pilot Knob to Ste. Genevieve. In 1856, there was a petition and court order for the construction of a road from Belleview Valley to Farmington. Transportation was dramatically changed after the St. Louis-Iron Mountain Railroad was opened in 1857. Today, hard-surface roads, including State Highways 21, 32, 49, and 72, extend to all parts of the county.

Farming

Clearing of the forest began with the first settlement in Belleview Valley in 1796. As the population increased, farming slowly spread and gradually involved a significant part of the valleys and basins. In 1982, about 18 percent of the county was cleared *(29)*. Nearly all of the cleared land is in the valleys, as are most of the productive soils. Also, the population is concentrated in the valleys. Only about 2 percent of the county is cropland, and 16 percent generally is pasture. These figures indicate the limited role of farming in Iron County. Crider, Courtois, Secesh, Auxvasse, Fourche, Lamotte, and Lowell are the major crop-producing soils in the county.

Farming is an important enterprise in the county, even though the acreage of farmland is limited *(30)*. This acreage made up about 36 percent of the county in 1954. It has steadily decreased because of an increase in the acreage used for woodland and other nonfarm purposes. In 1982, the farms generally were between 50 and 500 acres in size and averaged 213 acres. General farming is common, but nearly 90 percent of the farmers supplemented their incomes with off-farm employment in 1969. Cattle and poultry are the main cash products. Corn, soybeans, grain sorghum, and wheat are grown in the county, but their total acreage is small.

Physiography, Relief, and Drainage

The county has a unique variety of landforms, geologic formations, and surface features (fig. 2). Numerous faults extend across the county, mainly in a northwest-southeast direction *(20)*. The major landforms are the St. Francois Mountains; basins, such as Belleview Valley and Arcadia Valley; the Salem Plateau; and numerous small stream valleys.

The highest elevation in the county is 1,772 feet, at the summit of Taum Sauk Mountain. The lowest is about 450 feet, in an area in the southeast corner where Big Creek flows out of the county. The peaks and ridges of the St. Francois Mountains vary in elevation and were never a continuous plain. Elevations vary because of the general warping, tilting, and faulting of the sedimentary rocks adjacent to the mountains.

Local relief generally is 200 to 300 feet, but in a few areas it is more than 400 feet. The Salem Plateau is a distinct regional base level that is 400 to 600 feet below the higher mountain peaks. The intermountain basins are commonly 200 to 300 feet below the Salem Plateau. Where the basins are directly adjacent to the mountains, the relief can be nearly 1,000 feet. An example is in eastern Belleview Valley. A 900-foot difference in elevation is recorded between a shut-in where Saline Creek flows out of the valley and Buford Mountain, 4 miles away. Within the basin area, local relief is 100 feet to more than 200 feet in a few areas. Within the stream valleys, it is commonly less than 50 feet. Temporary base levels are evident in the valleys. Some of the so-called foot slopes may actually be benches or high terraces. They are commonly no more than 50 feet above the flood plains. The recognized terraces are 5 to 10 feet above the common flood plains and are never flooded or are very rarely flooded. Auxvasse and Secesh soils are on these terraces. The flood plains are the low areas bordering the stream channels. They are frequently flooded. Midco soils are in these areas.

A radial pattern of drainage developed around the St. Francois Mountains. Streams flow in all directions away from the central igneous mountain core. Cedar and Saline Creeks flow northward out of the county and eventually into the Meramec River. The St. Francois River and Stout and Marble Creeks flow eastward from the central dome. The St. Francois River begins on Buford Bottom, in the northeastern part of the county, and drains the eastern part of the county. Although Crane and Big Creeks flow south, they are really part of the St. Francois River system. Several small streams, such as Taum Sauk Creek, flow west from the central core into the Black River. In the northwest arm of the county, a more or less parallel drainage pattern formed. An east-west ridge divides drainage into north-flowing streams, such as Indian and Courtois Creeks and the Big River, and south-flowing streams, such as Henderson, Clayton, and Ottery Creeks.

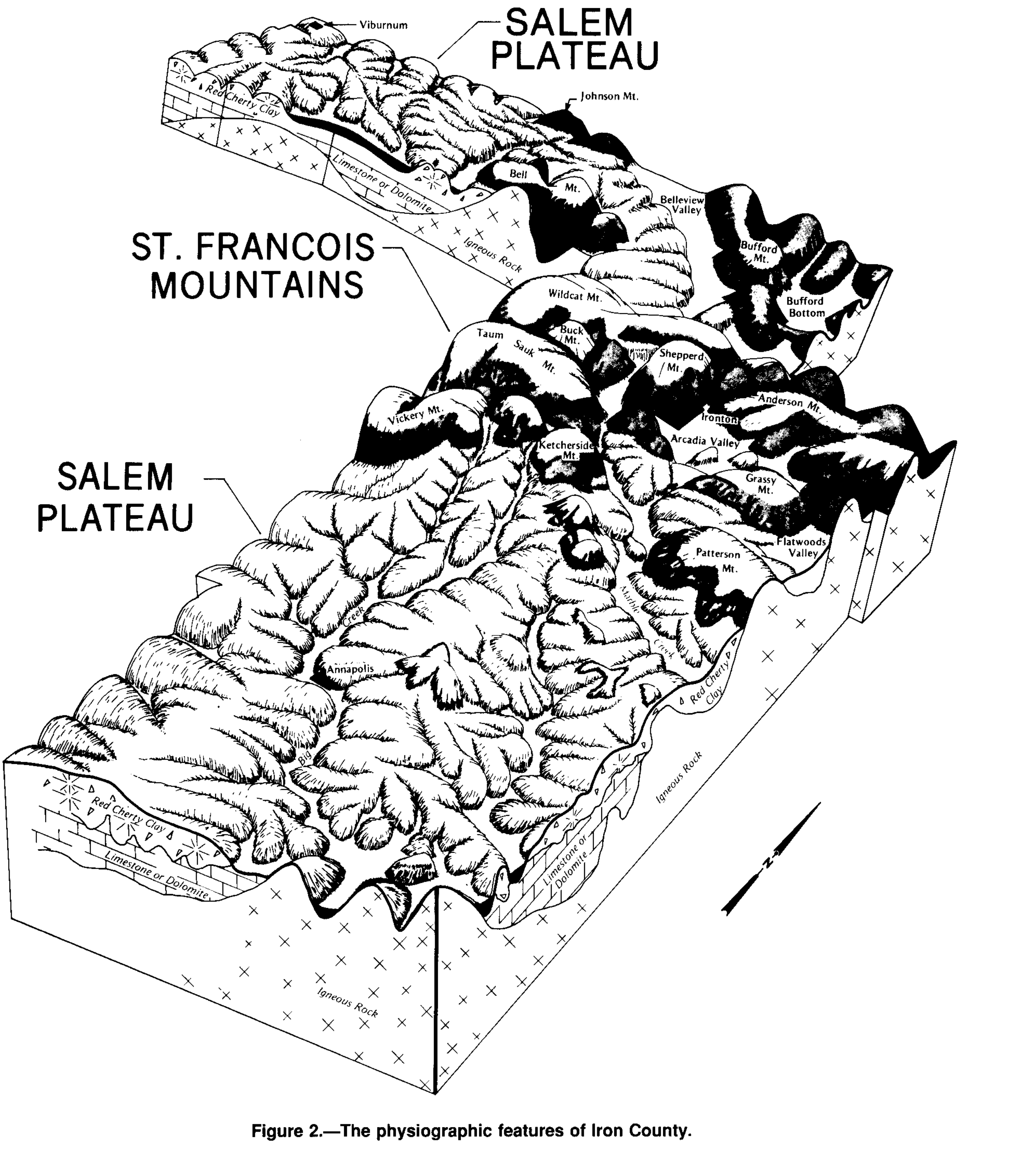

Figure 2.—The physiographic features of Iron County.

How This Survey Was Made

This survey was made to provide information about the soils in the survey area. The information includes a description of the soils and their location and a discussion of the suitability, limitations, and management of the soils for specified uses. Soil scientists observed the steepness, length, and shape of slopes; the general pattern of drainage; the kinds of crops and native plants growing on the soils; and the

kinds of bedrock. They dug many holes to study the soil profile, which is the sequence of natural layers, or horizons, in a soil. The profile extends from the surface down into the unconsolidated material in which the soil formed. The unconsolidated material is devoid of roots and other living organisms and has not been changed by other biological activity.

The soils in the survey area occur in an orderly pattern that is related to the geology, the landforms, relief, climate, and the natural vegetation of the area. Each kind of soil is associated with a particular kind of landscape or with a segment of the landscape. By observing the soils in the survey area and relating their position to specific segments of the landscape, a soil scientist develops a concept, or model, of how the soils were formed. Thus, during mapping, this model enables the soil scientist to predict with a considerable degree of accuracy the kind of soil at a specific location on the landscape.

Commonly, individual soils on the landscape merge into one another as their characteristics gradually change. To construct an accurate soil map, however, soil scientists must determine the boundaries between the soils. They can observe only a limited number of soil profiles. Nevertheless, these observations, supplemented by an understanding of the soil-landscape relationship, are sufficient to verify predictions of the kinds of soil in an area and to determine the boundaries.

Soil scientists recorded the characteristics of the soil profiles that they studied. They noted soil color, texture, size and shape of soil aggregates, kind and amount of rock fragments, distribution of plant roots, reaction, and other features that enable them to identify soils. After describing the soils in the survey area and determining their properties, the soil scientists assigned the soils to taxonomic classes (units). Taxonomic classes are concepts. Each taxonomic class has a set of soil characteristics with precisely defined limits. The classes are used as a basis for comparison to classify soils systematically. The system of taxonomic classification used in the United States is based mainly on the kind and character of soil properties and the arrangement of horizons within the profile. After the soil scientists classified and named the soils in the survey area, they compared the individual soils with similar soils in the same taxonomic class in other areas so that they could confirm data and assemble additional data based on experience and research.

While a soil survey is in progress, samples of some of the soils in the area generally are collected for laboratory analyses and for engineering tests. Soil scientists interpret the data from these analyses and tests as well as the field-observed characteristics and the soil properties to determine the expected behavior of the soils under different uses. Interpretations for all of the soils are field tested through observation of the soils in different uses under different levels of management. Some interpretations are modified to fit local conditions, and some new interpretations are developed to meet local needs. Data are assembled from other sources, such as research information, production records, and field experience of specialists. For example, data on crop yields under defined levels of management are assembled from farm records and from field or plot experiments on the same kinds of soil.

Predictions about soil behavior are based not only on soil properties but also on such variables as climate and biological activity. Soil conditions are predictable over long periods of time, but they are not predictable from year to year. For example, soil scientists can predict with a fairly high degree of accuracy that a given soil will have a high water table within certain depths in most years, but they cannot assure that a high water table will always be at a specific level in the soil on a specific date.

After soil scientists located and identified the significant natural bodies of soil in the survey area, they drew the boundaries of these bodies on aerial photographs and identified each as a specific map unit. Aerial photographs show trees, buildings, fields, roads, and rivers, all of which help in locating boundaries accurately.

Map Unit Composition

A map unit delineation on a soil map represents an area dominated by one major kind of soil or an area dominated by several kinds of soil. A map unit is identified and named according to the taxonomic classification of the dominant soil or soils. Within a taxonomic class there are precisely defined limits for the properties of the soils. On the landscape, however, the soils are natural objects. In common with other natural objects, they have a characteristic variability in their properties. Thus, the range of some observed properties may extend beyond the limits defined for a taxonomic class. Areas of soils of a single taxonomic class rarely, if ever, can be mapped without including areas of soils of other taxonomic classes. Consequently, every map unit is made up of the soil or soils for which it is named and some soils that belong to other taxonomic classes. These latter soils are called inclusions or included soils.

Most inclusions have properties and behavioral patterns similar to those of the dominant soil or soils in the map unit, and thus they do not affect use and management. These are called noncontrasting (similar) inclusions. They may or may not be mentioned in the map unit descriptions. Other inclusions, however, have properties and behavior divergent enough to affect use or require different management. These are contrasting (dissimilar) inclusions. They generally occupy small areas and cannot be shown separately on the soil maps because of the scale used in mapping. The inclusions of contrasting soils are mentioned in the map unit descriptions. A few inclusions may not have been observed and consequently are not mentioned in the descriptions, especially where the soil pattern was so complex that it was impractical to make enough observations to identify all of the kinds of soil on the landscape.

The presence of inclusions in a map unit in no way diminishes the usefulness or accuracy of the soil data. The objective of soil mapping is not to delineate pure taxonomic classes of soils but rather to separate the landscape into segments that have similar use and management requirements. The delineation of such landscape segments on the map provides sufficient information for the development of resource plans, but onsite investigation is needed to plan for intensive uses in small areas.

General Soil Map Units

The general soil map at the back of this publication shows the soil associations in this survey area. Each association has a distinctive pattern of soils, relief, and drainage. Each is a unique natural landscape. Typically, an association consists of one or more major soils and some minor soils. It is named for the major soils. The soils making up one association can occur in another but in a different pattern.

The general soil map can be used to compare the suitability of large areas for general land uses. Areas of suitable soils can be identified on the map. Likewise, areas where the soils are not suitable can be identified.

Because of its small scale, the map is not suitable for planning the management of a farm or field or for selecting a site for a road or building or other structure. The soils in any one association differ from place to place in slope, depth, drainage, and other characteristics that affect management.

The descriptions, names, and delineations of the soils identified on the general soil map of this county do not fully agree with those of the soils identified on the maps of adjacent counties published at a different date. Differences are the result of additional soil data, variations in the intensity of mapping, and correlation decisions that reflect local conditions. In some areas combining small acreages of similar soils that respond to use and management in much the same way is more practical than mapping these soils separately.

Soil Descriptions

1. Goss-Viburnum Association

Deep, gently sloping to steep, well drained and somewhat poorly drained soils that formed in a thin mantle of loess, in cherty, silty, and clayey sediments, and in cherty, red clay; on uplands of the Salem Plateau

This association consists of soils on a dissected landscape that has long, narrow ridgetops and steep side slopes. Elevations along the ridgetops range from about 1,300 feet in the western part of the county to about 800 feet in the southern part. Local relief ranges from 200 to 300 feet. Most areas border the major creek valleys. The regolith commonly is thick, as much as 75 to 100 feet in places. Slopes range from 3 to about 35 percent. The underlying bedrock commonly is cherty dolomite. It commonly crops out on low slopes bordering the major streams.

This association makes up about 17 percent of the county. It is about 56 percent Goss soils, 25 percent Viburnum soils, and 19 percent minor soils (fig. 3).

Goss soils are moderately steep and steep and are well drained. They are on side slopes. Typically, the surface layer is dark grayish brown very cherty silt loam about 2 inches thick. The subsurface layer is light yellowish brown very cherty silt loam about 7 inches thick. The upper part of the subsoil is red very cherty silty clay about 8 inches thick. The next part is dark red very cherty clay about 11 inches thick. The lower part to a depth of about 79 inches is dark red, mottled very cherty clay.

Viburnum soils are gently sloping and moderately sloping and are somewhat poorly drained. They are on ridges. Typically, the surface layer is dark grayish brown silt loam about 3 inches thick. The subsurface layer is yellowish brown silt loam about 4 inches thick. The upper 13 inches of the subsoil is brown silty clay loam and cherty silty clay loam. The next 8 inches is brown very cherty silty clay. The lower part to a depth of 60 inches or more is red extremely cherty clay.

Of minor extent in this association are the Clarksville, Lebanon, Midco, and Wilderness soils. Clarksville soils are steep and very steep and are somewhat excessively drained. They are on side slopes. Lebanon soils have a fragipan. They are on ridgetops. Midco soils are nearly level and gently sloping and are somewhat excessively drained. They are on narrow flood plains. Wilderness soils have a fragipan. They are on ridges and side slopes.

About 90 percent of this association is forested.

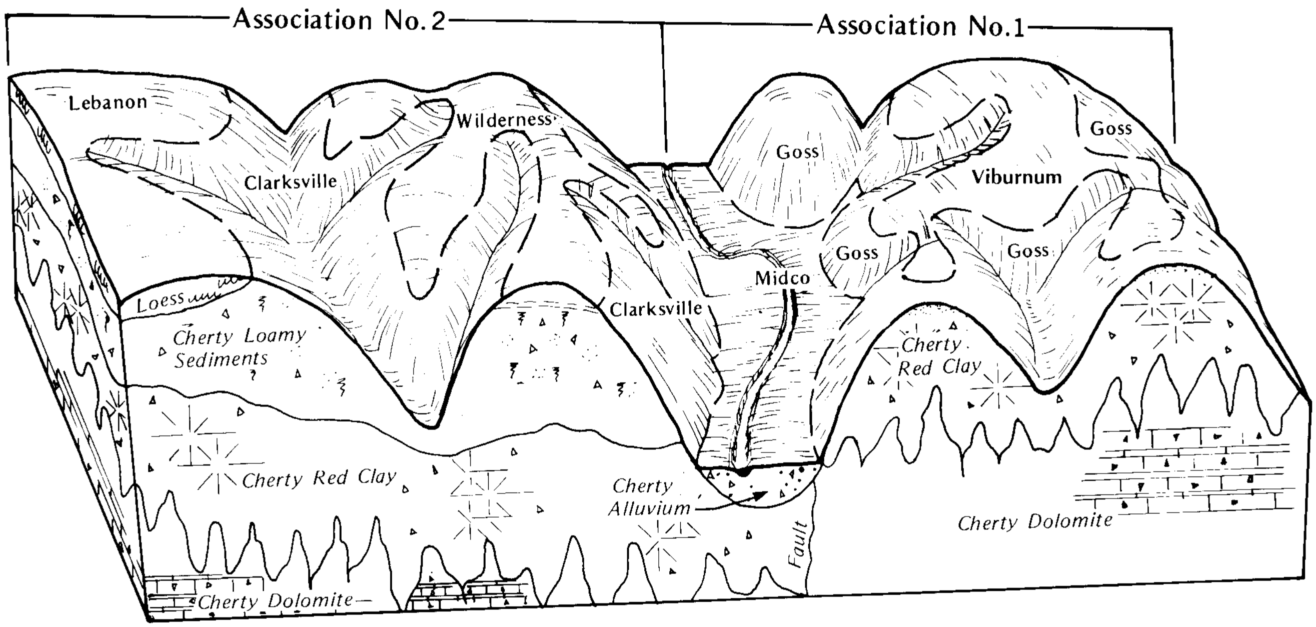

Figure 3.—Typical pattern of soils and parent material in the Goss-Viburnum and Clarksville-Wilderness associations on the Salem Plateau.

Some of the acreage is federal forest land. Cleared areas on foot slopes and on some ridges are used mainly for pasture.

The soils in this association generally are unsuited to cultivated crops because of the hazard of erosion, droughtiness, and the narrow, irregular shape of the areas of Viburnum soils. The slope, the cherty surface layer, and the hazard of drought are management concerns on the Goss soils. The soils that are commonly on the broader ridges and on foot slopes are better suited to cultivated crops than the other soils in the association.

The soils in this association are suited to pasture. Most areas along stream valleys are pastured. Droughtiness, low fertility, and the hazard of flooding are the main management concerns. Springs, streamflow, and small ponds provide water for livestock.

These soils are suitable for trees. The dominant trees are black oak, shortleaf pine, and hickory on south-facing slopes and white oak, northern red oak, and hickory on north-facing slopes. The slope restricts the use of logging equipment. Erosion is a hazard along logging roads and trails.

The Goss soils generally are unsuited to building site development and onsite waste disposal because of the slope. The Viburnum soils are suited to these uses, but the shrink-swell potential, wetness, restricted permeability, and the slope are management concerns.

2. Clarksville-Wilderness Association

Deep, moderately sloping to very steep, somewhat excessively drained and moderately well drained soils that formed in cherty, loamy sediment; on uplands of the Salem Plateau

This association consists of soils on a dissected landscape that has long, narrow ridgetops and steep side slopes (fig. 3). Elevations along the ridgetops in the western part of the county range from 1,300 to 1,500 feet, and those in the southern part range from 800 to 1,100 feet. Local relief ranges from 200 to 300 feet. All areas are drained by small intermittent streams that have fairly steep gradients. Springs or seeps are common in the small valleys. The underlying bedrock is cherty dolomite or cherty limestone. It crops out in a few areas on the lower slopes. The regolith is very thick, as much as 150 feet or more in places. Slopes range from 5 to 50 percent.

This association makes up about 41 percent of the county. It is about 55 percent Clarksville soils, 32 percent Wilderness soils, and 13 percent minor soils.

Clarksville soils are steep and very steep and are somewhat excessively drained. They are on side slopes. Typically, the surface layer is dark brown very

cherty silt loam about 3 inches thick. The subsurface layer is pale brown very cherty silt loam about 13 inches thick. The subsoil is about 52 inches thick. The upper part is brown very cherty silt loam; the next part is strong brown very cherty silty clay loam; and the lower part is yellowish red, mottled very cherty clay.

Wilderness soils are moderately sloping to steep and are moderately well drained. They are on ridgetops and side slopes. Typically, the surface layer is brown very cherty silt loam about 6 inches thick. The subsurface layer is yellowish brown very cherty silt loam about 10 inches thick. The upper part of the subsoil is yellowish red extremely cherty silty clay loam about 6 inches thick. The next part is a fragipan of reddish yellow very cherty silt loam about 11 inches thick. The lower part to a depth of about 75 inches is strong brown and yellowish red extremely cherty silty clay.

Of minor extent in this association are the Goss, Lebanon, and Midco soils. Goss soils are well drained and are on the lower side slopes. Lebanon soils are gently sloping and moderately sloping, are moderately well drained, and are on broad ridges. They have a fragipan. Midco soils formed in recent alluvium on flood plains. They are nearly level and gently sloping and are somewhat excessively drained.

About 95 percent of this association is forested. A large part of the acreage is federal or state forest land. Cleared areas in the small valleys and on some ridgetops are used mainly for pasture.

The soils in this association are suited to pasture. Erosion, the very cherty surface layer, droughtiness, and the slope are the main problems. The soils generally are unsuitable for cultivated crops and hay because of the slope and the cherty surface layer.

These soils are suitable for trees. The dominant trees are black oak, shortleaf pine, and hickory on south-facing slopes and white oak, northern red oak, and hickory on north-facing slopes. The slope restricts the use of logging equipment. Erosion is a hazard along logging roads and trails.

These soils generally are unsuitable for building site development and onsite waste disposal because of the slope. The less sloping Wilderness soils and some areas of the moderately sloping minor soils can be developed for urban uses. Wetness, slope, and restricted permeability are the main problems.

3. Irondale-Killarney-Knobtop Association

Moderately deep and deep, gently sloping to very steep, moderately well drained and well drained soils that formed in loess and in stony material weathered from igneous rocks; in the St. Francois Mountains

This association consists of soils on dome-shaped mountains and knobs. Most of the mountainous knobs are a few hundred feet higher than the adjacent landscapes. Elevations of the summits commonly range from about 1,500 to 1,772 feet, but some igneous rock crops out at the lower elevations. Taum Sauk Mountain, at an elevation of 1,772 feet, is the highest point in Missouri. Local relief ranges from about 300 to 900 feet. Most streams are small and have steep gradients. Shut-ins, which are narrow, steep-sided gorges, are common along these streams. The underlying bedrock is mainly rhyolite. The regolith is thin on most slopes but may be as much as 30 feet thick on colluvial slopes. Slopes range from about 3 to 50 percent.

This association makes up about 22 percent of the county. It is about 39 percent Irondale soils, 37 percent Killarney soils, 13 percent Knobtop soils, and 11 percent minor soils (fig. 4).

Irondale soils are moderately deep and well drained. They are on the rubbly upper side slopes. Typically, the surface layer is very dark grayish brown very cobbly silt loam about 3 inches thick. The subsurface layer is brown very cobbly silt loam about 5 inches thick. The subsoil is very cobbly silt loam about 15 inches thick. It is yellowish brown in the upper part and reddish brown in the lower part. The next 12 inches is a transitional layer of brown very cobbly silt loam. Rhyolite bedrock is at a depth of about 35 inches.

Killarney soils are deep and moderately well drained. They are on the very stony lower side slopes and foot slopes. Typically, the surface layer is dark grayish brown very cobbly silt loam about 3 inches thick. The subsurface layer is brown very cobbly silt loam about 4 inches thick. The upper 29 inches of the subsoil is yellowish brown and strong brown very cobbly silt loam and very cobbly and very gravelly silty clay loam. The lower part to a depth of about 80 inches is a brittle fragipan of light yellowish brown very gravelly silt loam.

Knobtop soils are moderately deep and moderately well drained. They are on mountainous ridgetops. Some areas are very stony. Typically, the surface layer is dark grayish brown silt loam about 2 inches thick. The subsurface layer is brown silt loam about 5 inches thick. The subsoil is about 29 inches thick. The upper part is brown silt loam and brown silty clay loam; the next part is brown, mottled silty clay loam; and the lower part is grayish brown, mottled silty clay loam. Below this is a transitional layer of light brownish gray, mottled silt

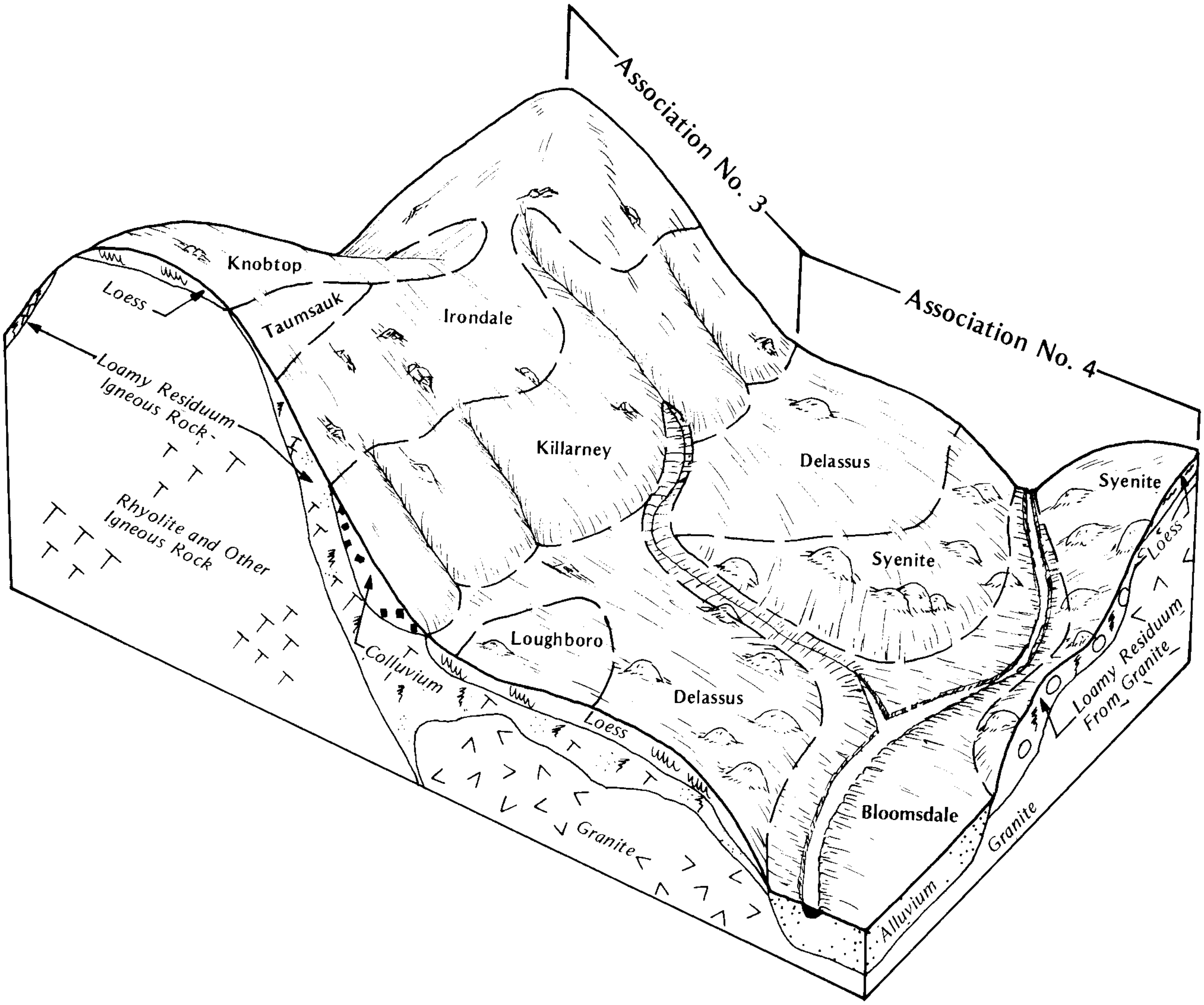

Figure 4.—Typical pattern of soils and parent material in the Irondale-Killarney-Knobtop and Delassus-Syenite associations in the St. Francois Mountains.

loam. Hard igneous bedrock is at a depth of about 36 inches.

Of minor extent in this association are the Bloomsdale, Delassus, and Taumsauk soils. Bloomsdale soils are deep, nearly level and gently sloping, and well drained. They are on narrow flood plains that carry runoff from the mountainous areas. Delassus soils are deep, have a fragipan, and have less chert than the Killarney soils. They are on foot slopes. Taumsauk soils are shallow and somewhat excessively drained. They are on mountainous slopes.

About 95 percent of the acreage in this association is forested. Part of this acreage is federal or state forest land. Cleared areas in small valleys and on some ridgetops are used for pasture.

The soils in this association generally are unsuitable for cultivated crops and pasture because of the hazard of erosion, droughtiness, and the chert or stones on the surface.

These soils are suitable for trees. The dominant trees are post oak, black oak, hickory, and shortleaf pine on south-facing slopes and white oak, northern red oak, and hickory on north-facing slopes. The slope and the stones restrict the use of logging equipment. Erosion is

a hazard along logging roads and trails. Low productivity affects the kinds of timber crops that can be economically grown in most areas.

The Irondale and Killarney soils are unsuitable for building site development and onsite waste disposal in most areas because of the slope and the depth to bedrock. The Knobtop soils are poorly suited to these uses, mainly because of wetness, the shrink-swell potential, the depth to bedrock, seepage, and the slope.

4. Delassus-Syenite Association

Deep and moderately deep, gently sloping to steep, moderately well drained and well drained soils that formed in a thin mantle of loess and in loamy material weathered from granite; in the St. Francois Mountains

This association consists of soils on a bouldery landscape at a lower elevation than the major mountains. Elevations in these areas commonly are 1,100 to 1,200 feet. Local relief ranges from 200 to 300 feet. Most streams are small and have a relatively steep gradient. The underlying bedrock is red granite. The regolith is thin. Slopes range from about 3 to 25 percent.

This association makes up about 1.5 percent of the county. It is about 42 percent Delassus soils, 35 percent Syenite soils, and 23 percent minor soils (fig. 4).

Delassus soils are deep and moderately well drained. They are on ridges and foot slopes. Some areas are bouldery. Typically, the surface layer is very dark grayish brown silt loam about 2 inches thick. The subsurface layer is yellowish brown silt loam about 4 inches thick. The subsoil is brown silty clay loam about 23 inches thick. Below this is a brittle fragipan. The upper part of the fragipan is grayish brown loam about 6 inches thick. The lower part to a depth of about 65 inches is yellowish brown loam.

Syenite soils are moderately deep and well drained. They are on extremely bouldery side slopes. Typically, the surface layer is dark grayish brown silt loam about 2 inches thick. The subsurface layer is yellowish brown silt loam about 4 inches thick. The subsoil is about 25 inches thick. The upper part is strong brown silty clay loam, the next part is brown clay loam, and the lower part is pale brown gravelly clay loam. Red granite bedrock is at a depth of about 31 inches.

Of minor extent in this association are the Bloomsdale and Loughboro soils. Bloomsdale soils are nearly level and gently sloping and are well drained. They are on narrow flood plains. Loughboro soils are nearly level and poorly drained. They are on uplands.

About 90 percent of this association is forested. Cleared areas are in a state park, are in quarries, or are used for pasture and hay. On most of the acreage, these soils are unsuitable for cultivated crops and for pasture or hay because of the slope, the hazard of erosion, and the boulders and stones on the surface. Some of the less steep areas on foot slopes and divides are suitable for cultivation.

These soils are suitable for trees. The dominant trees are northern red oak, post oak, white oak, and some shortleaf pine. Boulders, stones, and the slope restrict the use of logging equipment. Erosion is a hazard along logging roads and trails.

The Delassus soils generally are suited to building site development and onsite waste disposal. Wetness, the shrink-swell potential, restricted permeability, the depth to bedrock, seepage, and the slope are the main problems. The Syenite soils generally are unsuited to these urban uses because of the depth to bedrock, the slope, and wetness.

5. Courtois-Fourche-Gatewood Association

Deep and moderately deep, gently sloping to moderately steep, moderately well drained and well drained soils that formed in loess and in clayey sediment; on ridges and side slopes in valleys and basins

This association consists of soils on undulating to hilly uplands surrounded by an escarpment of higher hills and mountainous knobs. The two larger basins are Belleview (Bellevue) Valley and Arcadia Valley. Elevations along the ridgetops in these basins range from 900 to 1,100 feet. Local relief commonly is less than 100 feet. Most of the streams that drain this association are small and have low gradients. The underlying bedrock is dolomite and some sandstone. Outcrops are common in some areas. The regolith ranges from about 20 inches to 10 feet in thickness. Slopes range from 3 to 20 percent.

This association makes up about 11.5 percent of the county. It is about 28 percent Courtois soils, 24 percent Fourche and similar soils, 20 percent Gatewood soils, and 28 percent minor soils (fig. 5).

Courtois soils are deep, gently sloping to strongly sloping, and well drained. They are on ridgetops, side slopes, and foot slopes. Typically, the surface layer is very dark grayish brown silt loam about 2 inches thick. The subsoil extends to a depth of 60 inches or more. In sequence downward, it is dark brown silt loam; reddish brown silty clay; dark red, mottled very cherty clay; and dark red, mottled clay.

Fourche soils are deep, gently sloping and

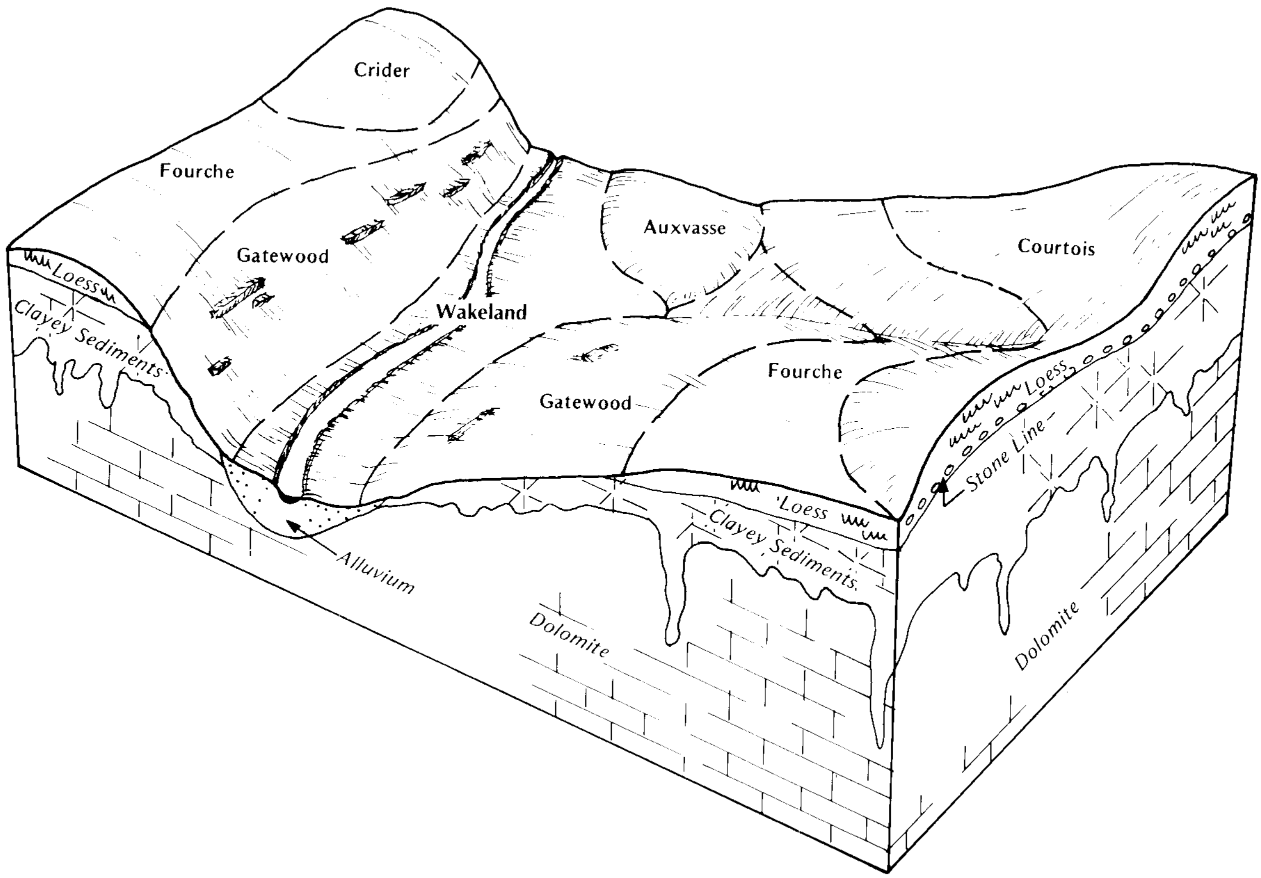

Figure 5.—Typical pattern of soils and parent material in the Courtois-Fourche-Gatewood association.

moderately sloping, and moderately well drained. They are on ridges and side slopes. Typically, the surface layer is dark grayish brown silt loam about 5 inches thick. The subsurface layer is yellowish brown silt loam about 5 inches thick. The upper part of the subsoil is strong brown silt loam and yellowish brown silty clay loam. The next part is brown silty clay loam that has coatings of light brownish gray silt loam. The lower part to a depth of about 65 inches is reddish brown and strong brown clay.

Gatewood soils are moderately deep, gently sloping to moderately steep, and moderately well drained. They are on ridges and side slopes. Typically, the surface layer is very dark grayish brown silt loam about 3 inches thick. The subsurface layer is brown silt loam about 3 inches thick. The subsoil is very firm clay about 23 inches thick. The upper part is yellowish red, the next part is dark brown, and the lower part is dark yellowish brown. Hard dolomite bedrock is at a depth of about 29 inches.

Of minor extent in this association are the Auxvasse, Dameron, Lowell, and Wakeland soils. Auxvasse soils are nearly level and poorly drained. They are on stream terraces. Dameron soils are dark and nearly level. They are on flood plains. Lowell soils are browner in the subsoil than the Fourche and Courtois soils and have less clay than the Gatewood soils. They are on ridges. Wakeland soils are somewhat poorly drained and are on flood plains.

About 75 percent of the acreage in this association has been cleared and is used for cultivated crops, pasture, or hay. The more sloping, more shallow, and stony soils support mixed hardwoods. The production of beef cattle and poultry and, to a lesser extent, feed grains are the main farm enterprises. Some areas are used for building site development or other urban uses.

The soils in this association are suitable for cultivated crops, pasture, and hay. The Courtois and Fourche soils are well suited to these uses. The Gatewood soils are droughty and are best suited to small grain,

pasture, and hay. Corn, wheat, soybeans, and grain sorghum are the main cultivated crops. Tall fescue, orchardgrass, red clover, and alfalfa are grown in areas used for pasture and hay. Maintaining fertility and reducing the hazard of erosion are the major management concerns.

These soils are suitable for trees. Most areas that support trees occur as areas of the less productive soils. Some areas are shallow to bedrock or are stony.

These soils generally are suited to building site development and onsite waste disposal. The main problems are restricted permeability in all three soils, a seasonal high water table in the Fourche soils, the depth to bedrock in the Gatewood soils, and the shrink-swell potential of the Courtois soils.

6. Midco-Secesh-Viraton Association

Deep, nearly level to moderately sloping, somewhat excessively drained to moderately well drained soils that formed in loamy and gravelly alluvium or colluvium; in stream valleys

This association consists of soils in long, narrow valleys along the major streams. The valleys are 200 to more than 2,000 feet wide. They include flood plains, stream terraces, and foot slopes. The stream terraces are 5 to 15 feet above the flood plains. The foot slopes are 10 to about 100 feet above the flood plains. Elevations along the flood plains range from about 900 to 1,000 feet on the upper reaches of the streams and are as low as 660 feet on the lower reaches of Big Creek. Springs and seeps are common. The regolith is 5 to more than 10 feet thick. Slopes range from 0 to 9 percent.

This association makes up about 7 percent of the county. It is about 60 percent Midco soils, 16 percent Secesh soils, 10 percent Viraton soils, and 14 percent minor soils.

Midco soils are nearly level and gently sloping and are somewhat excessively drained. They are on flood plains. Typically, the surface layer is dark brown cherty loam about 7 inches thick. Below this to a depth of about 60 inches are strata of brown very cherty and extremely cherty loam and extremely cherty sandy loam.

Secesh soils are nearly level and gently sloping and are well drained. They are on stream terraces. Typically, the surface layer is brown silt loam about 7 inches thick. The subsoil extends to a depth of 60 inches or more. The upper part is dark brown silt loam, the next part is strong brown cherty clay loam, and the lower part is dark yellowish brown extremely cherty sandy clay.

Viraton soils are gently sloping and moderately sloping and are moderately well drained. They are on foot slopes. Typically, the surface layer is brown silt loam about 4 inches thick. The subsurface layer is yellowish brown silt loam about 4 inches thick. The part of the subsoil above a fragipan is about 13 inches of strong brown and yellowish brown silty clay loam and 10 inches of grayish brown, mottled silty clay loam. The fragipan is yellowish brown, brittle very cherty silt loam about 28 inches thick. The part of the subsoil below the fragipan extends to a depth of about 71 inches or more. It is yellowish brown cherty silty clay.

Of minor extent in this association are the Auxvasse, Courtois, and Fourche soils. Auxvasse soils are poorly drained and are on stream terraces. Courtois and Fourche soils are on foot slopes. They have a reddish subsoil. Courtois soils are gently sloping to strongly sloping.

The soils in this association are suitable for cultivated crops, pasture, and hay. Corn, wheat, soybeans, and grain sorghum are the main cultivated crops. Tall fescue, orchardgrass, red clover, and alfalfa are grown in areas used for pasture and hay. The major management concerns are maintaining fertility and reducing the hazards of erosion and drought. Flooding and excessive chert in the surface layer are additional management problems in areas of the Midco soils.

These soils are suitable for trees. The dominant trees are white oak, northern red oak, black oak, and hickory on the Viraton soils and white oak, sugar maple, ash, black walnut, and sycamore on the Secesh and Midco soils. Seedling mortality is moderate on the Viraton and Midco soils. Also, windthrow is a moderate hazard on the Viraton soils. No major hazards or limitations affect planting or harvesting on the Secesh soils.

Although wetness is a limitation, the Viraton soils generally are suited to building site development. They generally are unsuitable as sites for septic tank absorption fields because of restricted permeability. The Midco and Secesh soils are unsuited to building site development and onsite waste disposal because of the hazards of flooding and seepage.

Detailed Soil Map Units

The map units on the detailed soil maps at the back of this survey represent the soils in the survey area. The map unit descriptions in this section, along with the soil maps, can be used to determine the suitability and potential of a soil for specific uses. They also can be used to plan the management needed for those uses. More information on each map unit, or soil, is given under "Use and Management of the Soils."

Each map unit on the detailed soil maps represents an area on the landscape and consists of one or more soils for which the unit is named.

A symbol identifying the soil precedes the map unit name in the soil descriptions. Each description includes general facts about the soil and gives the principal hazards and limitations to be considered in planning for specific uses.

Soils that have profiles that are almost alike make up a *soil series*. Except for differences in texture of the surface layer or of the substratum, all the soils of a series have major horizons that are similar in composition, thickness, and arrangement.

Soils of one series can differ in texture of the surface layer or of the substratum. They also can differ in slope, stoniness, wetness, degree of erosion, and other characteristics that affect their use. On the basis of such differences, a soil series is divided into *soil phases*. Most of the areas shown on the detailed soil maps are phases of soil series. The name of a soil phase commonly indicates a feature that affects use or management. For example, Crider silt loam, 2 to 5 percent slopes, is a phase of the Crider series.

Some map units are made up of two or more major soils. These map units are called soil complexes. A *soil complex* consists of two or more soils, or one or more soils and a miscellaneous area, in such an intricate pattern or in such small areas that they cannot be shown separately on the soil maps. The pattern and proportion of the soils are somewhat similar in all areas. Taumsauk-Irondale-Rock outcrop complex, 15 to 40 percent slopes, rubbly, is an example.

Most map units include small scattered areas of soils other than those for which the map unit is named. Some of these included soils have properties that differ substantially from those of the major soil or soils. Such differences could significantly affect use and management of the soils in the map unit. The included soils are identified in each map unit description. Some small areas of strongly contrasting soils are identified by a special symbol on the soil maps.

This survey includes *miscellaneous areas*. Such areas have little or no soil material and support little or no vegetation. Pits and dumps is an example. Miscellaneous areas are shown on the soil maps. Some that are too small to be shown are identified by a special symbol on the soil maps.

The descriptions, names, and delineations of soils identified on the detailed soil maps of this county do not fully agree with those of the soils identified on the maps of adjacent counties published at a different date. Differences are the result of additional soil data, variations in the intensity of mapping, and correlation decisions that reflect local conditions. In some areas combining small acreages of similar soils that respond to use and management in much the same way is more practical than mapping these soils separately.

Table 4 gives the acreage and proportionate extent of each map unit. Other tables (see "Summary of Tables") give properties of the soils and the limitations, capabilities, and potentials for many uses. The Glossary defines many of the terms used in describing the soils.

Soil Descriptions

1C—Lamotte silt loam, 3 to 9 percent slopes. This deep, gently sloping and moderately sloping, well drained soil is on ridges adjacent to Buford Mountain. Individual areas are irregularly shaped and range from about 10 to more than 100 acres in size.

Typically, the surface layer is dark brown silt loam about 8 inches thick. The subsoil is about 54 inches thick. The upper part is reddish brown loam and clay

loam. The lower part is reddish brown and red clay loam. Hard sandstone bedrock is at a depth of about 62 inches.

Permeability is moderately slow. Surface runoff is medium. The available water capacity is moderate. The surface layer is friable and can be easily tilled. Natural fertility is medium, and the content of organic matter is low. The rooting depth is not restricted. The subsoil has a moderate shrink-swell potential.

Most areas have been cleared and are used for pasture and hay. This soil is suited to cultivated crops. The main management concerns are controlling erosion, maintaining tilth and fertility, and in some areas controlling the scouring and deposition caused by runoff from the adjacent uplands. Terraces and a system of conservation tillage that leaves protective amounts of crop residue on the surface help to control erosion. No limitations affect terracing. Crop rotations in which grasses and legumes are grown in about 2 years out of 3 help to control erosion. Conservation tillage can increase the number of years during which cultivated crops can be grown in the rotation. Conservation tillage and additions of manure, lime, and fertilizer help to keep the soil in good tilth and maintain fertility. Diversion terraces can protect some fields against runoff from the adjacent areas.

This soil is well suited to most of the commonly grown legumes, such as alfalfa and red clover; to cool-season grasses, such as smooth brome and orchardgrass; and to warm-season grasses, such as big bluestem, indiangrass, and switchgrass. No serious problems affect pasture or hayland. Erosion is a hazard in areas that are tilled before they are seeded. Timely seedbed preparation helps to ensure a good ground cover. The main management concerns are preventing overgrazing and maintaining a good stand. Overgrazing causes compaction, deterioration of the stand, and excessive runoff. Proper stocking rates, pasture rotation, deferred grazing, and applications of fertilizer help to keep the pasture in good condition.

About 35 percent of the acreage supports hardwoods or cedars. This soil is suited to trees. Plant competition is a limitation where seedlings are planted. It can be controlled by proper site preparation, prescribed burning, applications of herbicide, or cutting. No major hazards or limitations affect planting or harvesting.

This soil is suitable for building site development and onsite waste disposal. The shrink-swell potential is a limitation on sites for dwellings. Footings, foundations, and basement walls should be reinforced so that they can withstand the shrinking and swelling of the soil. Restricted permeability is a moderate limitation on sites for septic tank absorption fields, but this limitation can be overcome by increasing the size of the absorption field. The soil can be used as a site for sewage lagoons if grading modifies the slope. Seepage is a limitation, but sealing the bottom of the lagoon helps to prevent contamination of the ground water.

Low strength and frost action are limitations on sites for local roads and streets. Strengthening the base with crushed rock or other suitable material helps to prevent the damage resulting from low strength. Roadside ditches minimize the damage caused by frost action.

The land capability classification is IIIe. The woodland ordination symbol is 3A.

2B—Gatewood silt loam, 2 to 5 percent slopes. This moderately deep, gently sloping, moderately well drained soil is on ridges in the uplands. Most areas are long and narrow and range from about 10 to more than 200 acres in size.

Typically, the surface layer is very dark grayish brown silt loam about 9 inches thick. The upper part of the subsoil is reddish brown silty clay about 10 inches thick. The lower part is dark yellowish brown clay about 10 inches thick. Hard dolomite bedrock is at a depth of about 29 inches. In some areas the soil is red throughout the subsoil and is well drained.

Included with this soil in mapping are areas of Crider and Gasconade soils. Crider soils are deep and well drained. They are on uplands. Gasconade soils are shallow and somewhat excessively drained. They are on side slopes. Included soils make up about 15 percent of the unit.

Permeability is slow in the Gatewood soil. Surface runoff is medium. The available water capacity is low. The surface layer is friable and can be easily tilled. Natural fertility is medium, and the content of organic matter is moderately low. The rooting depth is restricted by the underlying bedrock. The subsoil has a high shrink-swell potential.

Most areas have been cleared and are used for pasture and hay. This soil is suited to cultivated crops, hay, and pasture. It is best suited to small grain and drought-tolerant crops because of the low available water capacity.

The main management concerns in cultivated areas are keeping erosion to a minimum, reducing the hazard of drought, and maintaining tilth and fertility. Terraces, a system of conservation tillage that leaves protective amounts of crop residue on the surface, winter cover crops, grassed waterways, and contour farming help to control erosion. Where terraces are constructed, unfavorable subsoil material and the depth to bedrock

can hinder revegetation after construction. The depth of the terrace cut and the design of the terrace system should be adjusted so that infertile soil is not exposed in small areas. Because the soil is easily eroded, the terraces should be closely spaced or should be used in conjunction with a conservation tillage system. Some type of grade stabilization structure generally is needed in grassed waterways. Crop rotations in which grasses or legumes are grown in 2 years out of 3 help to control erosion. Conservation tillage can increase the number of years in which cultivated crops are included in the rotation. Conservation tillage and additions of manure, lime, and fertilizer help to keep the soil in good tilth and maintain fertility.

This soil is moderately well suited to legumes, such as lespedeza and birdsfoot trefoil; to cool-season grasses, such as tall fescue and orchardgrass; and to warm-season grasses, such as big bluestem, Caucasian bluestem, and indiangrass. The rooting depth is moderate, and droughtiness is a problem during part of the growing season. Shallow-rooted species that can tolerate droughtiness should be selected for planting. Erosion is a hazard in areas that are tilled before they are seeded. Timely tillage and a quickly established ground cover help to prevent excessive erosion. The main management concerns are preventing overgrazing and maintaining a good stand. Overgrazing causes compaction, deterioration of the stand, and excessive runoff. Proper stocking rates, pasture rotation, deferred grazing, and applications of fertilizer help to keep the pasture in good condition.

This soil is well suited to trees. No major hazards or limitations affect planting, harvesting, or tree growth.

This soil is suitable as a site for dwellings without basements, but it generally is unsuitable as a site for dwellings with basements because of the depth to bedrock. The depth to bedrock and the shrink-swell potential are limitations on sites for dwellings without basements. Ensuring that enough soil underlies footings and foundations helps to prevent the damage caused by uneven settlement. The footings and foundations should be reinforced so that they can withstand the shrinking and swelling of the soil. The soil generally is unsuitable as a site for septic tank absorption fields and sewage lagoons because of the depth to bedrock. Other disposal systems, such as a mound system, can be used, or the waste can be piped to adjacent areas where the soils are better suited to onsite waste disposal. Onsite investigation can help to determine the design and feasibility of onsite waste disposal systems.

Low strength, frost action, and the shrink-swell potential are limitations on sites for local roads and streets. Strengthening the base with crushed rock or other suitable material helps to prevent the damage resulting from low strength and from shrinking and swelling. Roadside ditches minimize the damage caused by frost action.

The land capability classification is IVe. The woodland ordination symbol is 2A.

2C—Gatewood silt loam, 5 to 9 percent slopes. This moderately deep, moderately sloping, moderately well drained soil is on side slopes and ridges in the uplands. Most areas are long and narrow and range from about 10 to more than 200 acres in size.

Typically, the surface layer is very dark grayish brown silt loam about 3 inches thick. The subsurface layer is brown silt loam about 3 inches thick. The subsoil is clay about 23 inches thick. The upper part is yellowish red, the next part is dark brown, and the lower part is dark yellowish brown. Hard dolomite bedrock is at a depth of about 29 inches.

Included with this soil in mapping are areas of Crider and Gasconade soils. Crider soils are deep and well drained. They are on ridgetops. Gasconade soils are shallow and somewhat excessively drained. They are on side slopes. Included soils make up about 15 percent of the unit.

Permeability is slow in the Gatewood soil. Surface runoff is medium. The available water capacity is low. The surface layer is friable and can be easily tilled. Natural fertility is medium, and the content of organic matter is moderately low. The rooting depth is restricted by the underlying bedrock. The subsoil has a high shrink-swell potential.

Most areas have been cleared and are used for pasture and hay. This soil is suited to cultivated crops, hay, and pasture. It is best suited to small grain and drought-tolerant crops because of the low available water capacity.

The main management concerns in cultivated areas are keeping erosion to a minimum, reducing the hazard of drought, and maintaining tilth and fertility. Terraces, a system of conservation tillage that leaves protective amounts of crop residue on the surface, winter cover crops, grassed waterways, and contour farming help to control erosion. Where terraces are constructed, unfavorable subsoil material and the depth to bedrock can hinder revegetation after construction. The depth of the terrace cut and the design of the terrace system should be adjusted so that infertile soil is not exposed in small areas. Because the soil is easily eroded, the terraces should be closely spaced or should be used in conjunction with a conservation tillage system. Some

type of grade stabilization structure generally is needed in grassed waterways. Crop rotations in which grasses and legumes are grown in about 3 years out of 4 help to control erosion. Conservation tillage can increase the number of years in which cultivated crops are included in the rotation. Conservation tillage and additions of manure, lime, and fertilizer can help to keep the soil in good tilth and maintain fertility.

This soil is moderately well suited to legumes, such as lespedeza and birdsfoot trefoil; to cool-season grasses, such as tall fescue and orchardgrass; and to warm-season grasses, such as big bluestem, Caucasian bluestem, and indiangrass. The rooting depth is moderate, and droughtiness is a problem during part of the growing season. Shallow-rooted species that can tolerate droughtiness should be selected for planting. Erosion is a hazard in areas that are tilled before they are seeded. Timely tillage and a quickly established ground cover help to prevent excessive erosion. The main management concerns are preventing overgrazing and maintaining a good stand. Overgrazing causes compaction, deterioration of the stand, and excessive runoff. Proper stocking rates, pasture rotation, deferred grazing, and applications of fertilizer help to keep the pasture in good condition.

This soil is well suited to trees. No major hazards or limitations affect planting, harvesting, or tree growth.

This soil is poorly suited to dwellings without basements because of the depth to bedrock and the shrink-swell potential. Ensuring that enough soil underlies footings and foundations helps to prevent the damage caused by uneven settlement. The footings and foundations should be reinforced so that they can withstand the shrinking and swelling of the soil. The soil is generally unsuitable as a site for dwellings with basements, septic tank absorption fields, and sewage lagoons because of the depth to bedrock. Other disposal systems, such as a mound system, can be used, or the waste can be piped to adjacent areas where the soils are better suited to onsite waste disposal. Onsite investigation can help to determine the design and feasibility of onsite waste disposal systems.

Low strength, frost action, and the shrink-swell potential are limitations on sites for local roads and streets. Strengthening the base with crushed rock or other suitable material helps to prevent the damage resulting from low strength and from shrinking and swelling. Roadside ditches minimize the damage caused by frost action.

The land capability classification is IVe. The woodland ordination symbol is 2A.

2D—Gatewood silt loam, 9 to 14 percent slopes. This moderately deep, strongly sloping, moderately well drained soil is on side slopes in the uplands. Most areas are long and narrow and range from about 10 to more than 200 acres in size.

Typically, the surface layer is very dark grayish brown silt loam about 7 inches thick. The upper part of the subsoil is brown and yellowish brown clay about 15 inches thick. The lower part is yellowish brown clay that has light brownish gray mottles and a few chert pebbles. Hard dolomite bedrock is at a depth of about 27 inches.

Included with this soil in mapping are areas of Crider and Gasconade soils. Crider soils are deep and well drained. They are in landscape positions similar to those of the Gatewood soil. Gasconade soils are shallow and somewhat excessively drained. They are on side slopes. Included soils make up about 15 percent of the unit.

Permeability is slow in the Gatewood soil. Surface runoff is medium. The available water capacity is low. The surface layer is friable and can be easily tilled. Natural fertility is medium, and the content of organic matter is moderately low. The rooting depth is restricted by the underlying bedrock. The subsoil has a high shrink-swell potential.

Most areas have been cleared and are used for pasture and hay. Some areas support trees. Because of the hazard of erosion, this soil generally is unsuitable for cultivated crops. It is moderately well suited to some legumes, such as lespedeza and birdsfoot trefoil; to some cool-season grasses, such as tall fescue and reed canarygrass; and to warm-season grasses, such as big bluestem, Caucasian bluestem, and indiangrass. It is moderately suited to most legumes and cool-season grasses. Shallow-rooted species that can tolerate droughtiness should be selected for planting. Erosion is a hazard in areas that are tilled before they are seeded. Timely tillage and a quickly established ground cover help to prevent excessive erosion. The main management concerns are preventing overgrazing and maintaining a good stand. Overgrazing causes compaction, deterioration of the stand, and excessive runoff. Proper stocking rates, pasture rotation, deferred grazing, and applications of fertilizer help to keep the pasture in good condition.

This soil is well suited to trees. No major hazards or limitations affect planting or harvesting.

This soil is poorly suited to dwellings without basements because of the depth to bedrock, the slope, and the shrink-swell potential. Ensuring that enough soil

underlies footings and foundations helps to prevent the damage caused by uneven settlement. The footings and foundations should be reinforced so that they can withstand the shrinking and swelling of the soil. Land leveling is needed. The soil is generally unsuitable as a site for dwellings with basements and for septic tank absorption fields and sewage lagoons because of the depth to bedrock. Other disposal systems, such as a mound system, can be used, or the waste can be piped to adjacent areas where the soils are better suited to onsite waste disposal. Onsite investigation can help to determine the design and feasibility of onsite waste disposal systems.

Low strength, frost action, the slope, and the shrink-swell potential are limitations on sites for local roads and streets. Strengthening the base with crushed rock or other suitable material helps to prevent the damage resulting from low strength and from shrinking and swelling. Local roads and streets should be designed so that they conform to the natural slope of the land. Cutting and filling are needed in some areas. Roadside ditches minimize the damage caused by frost action.

The land capability classification is VIe. The woodland ordination symbol is 2A.

2E—Gatewood silt loam, 14 to 20 percent slopes, stony. This moderately deep, moderately steep, moderately well drained soil is on side slopes in the uplands. Stones commonly cover 0.01 to 0.1 percent of the surface. Most areas are long and narrow and range from about 10 to more than 200 acres in size.

Typically, the surface layer is dark grayish brown silt loam about 4 inches thick. The upper part of the subsoil is brown and yellowish brown cherty clay about 14 inches thick. The lower part is yellowish brown clay that has a few dark grayish brown mottles and black stains. Hard dolomite bedrock is at a depth of about 24 inches.

Included with this soil in mapping are areas of Crider and Gasconade soils and rock outcrop. Crider soils are deep and well drained. They are on ridgetops and side slopes. Gasconade soils are shallow and somewhat excessively drained. They are on side slopes. Rock outcrop is in scattered areas throughout the unit. Included areas make up about 15 percent of the unit.

Permeability is slow in the Gatewood soil. Surface runoff is rapid. The available water capacity is low. The surface layer is friable and can be easily tilled. Natural fertility is medium, and the content of organic matter is moderately low. The rooting depth is restricted by the underlying bedrock. The subsoil has a high shrink-swell potential.

Most areas are forested. A few areas are used for pasture. Because of the slope and the surface stones, this soil generally is unsuitable for cultivated crops and hay. It is moderately well suited to some legumes, such as lespedeza and birdsfoot trefoil; to some cool-season grasses, such as tall fescue and reed canarygrass; and to warm-season grasses, such as big bluestem, Caucasian bluestem, and indiangrass. It is moderately suited to most legumes and cool-season grasses. Shallow-rooted species that can tolerate droughtiness should be selected for planting. Drought-tolerant perennials grow best. Erosion is a hazard in areas that are tilled before they are seeded. Timely tillage and a quickly established ground cover help to prevent excessive erosion. A pasture can be more easily established and managed in the less stony areas. Large stones can be removed. A seedbed can be prepared by controlled burning. Brush and weed control can be a continuing problem. Girdling, cutting, or applications of herbicide are needed. The main management concerns are preventing overgrazing and maintaining a good stand. Overgrazing causes compaction, deterioration of the stand, and excessive runoff. Proper stocking rates, pasture rotation, deferred grazing, and applications of fertilizer help to keep the pasture in good condition.

This soil is suited to trees. The hazard of erosion and the equipment limitation are management concerns. Erosion generally occurs along logging trails. Building logging roads and trails on the contour and seeding them after the trees are harvested help to control erosion. The slope, the stony surface, and low strength limit the use of equipment. Logs can be yarded uphill to logging roads that have been cleared of large stones and boulders. Excessive rut formation and miring are problems when the soil is wet. The use of equipment can be delayed until the soil is dry. Adding gravel or other suitable material to the main logging roads helps to prevent excessive rut formation and miring. Properly managing the stand helps to ensure natural regeneration.

This soil is suited to woodland wildlife habitat. It supports diverse plant species in many areas. The habitat can be improved by leaving den trees, maintaining a diversity of vegetation, and providing food and water. Very small areas that are suitable for food plots are common. These areas are gently sloping or moderately sloping and have fewer stones in the surface layer than other areas.

This soil generally is unsuitable for building site development and onsite waste disposal because of the slope, the depth to bedrock, and the stony surface.

The land capability classification is VIIs. The woodland ordination symbol is 2R.

4C—Knobtop silt loam, 3 to 9 percent slopes. This moderately deep, gently sloping and moderately sloping, moderately well drained soil is on mountainous ridgetops and peaks and in saddles between the peaks. A few stones or boulders cover less than 0.01 percent of the surface. Most areas are oval or elongated and range from about 10 to more than 200 acres in size.

Typically, the surface layer is dark grayish brown silt loam about 2 inches thick. The subsurface layer is brown silt loam about 5 inches thick. The subsoil is about 29 inches thick. The upper part is brown silt loam and silty clay loam; the next part is grayish brown and brown, mottled silty clay loam; and the lower part is light brownish gray, mottled silt loam. Hard igneous bedrock is at a depth of about 36 inches.

Included with this soil in mapping are areas of Delassus and Irondale soils. Delassus soils are deep, are moderately well drained, and have a fragipan. They are in landscape positions similar to those of the Knobtop soil. Irondale soils contain more than 35 percent rock fragments and have a rubbly surface. They are on the upper side slopes and undulating mountaintops. Included soils make up about 8 percent of the unit.

Permeability is moderately slow in the Knobtop soil. Surface runoff is medium. The available water capacity is low. Natural fertility and the content of organic matter also are low. The surface layer is friable. The rooting depth is limited by the underlying bedrock at a depth of about 36 inches. In some periods during winter and spring, a perched water table is above the bedrock. The subsoil has a moderate shrink-swell potential.

Most areas are forested and are somewhat inaccessible. A few areas have been cleared and are used for pasture or hay. This soil is suited to cultivated crops, hay, and pasture. It is best suited to small grain and drought-tolerant crops because of the low available water capacity.

The main management concerns in cultivated areas are keeping erosion to a minimum, reducing the hazard of drought, and maintaining tilth and fertility. Terraces, a system of conservation tillage that leaves protective amounts of crop residue on the surface, winter cover crops, grassed waterways, and contour farming can reduce the hazard of erosion. Where terraces are constructed, unfavorable subsoil material and the depth to bedrock can hinder revegetation after construction. The depth of the terrace cut and the design of the terrace system should be adjusted so that infertile soil is not exposed in small areas. Because the soil is easily eroded, the terraces should be closely spaced or should be used in conjunction with a conservation tillage system. Some type of grade stabilization structure generally is needed in grassed waterways. Crop rotations in which grasses and legumes are grown in about 2 years out of 3 help to control erosion. Conservation tillage can increase the number of years in which cultivated crops are included in the rotation. Irrigation water generally is not available because the underlying bedrock is a poor aquifer. Conservation tillage and additions of manure, lime, and fertilizer help to keep the soil in good tilth and maintain fertility.

This soil is moderately well suited to legumes, such as lespedeza and birdsfoot trefoil; to cool-season grasses, such as tall fescue and orchardgrass; and to warm-season grasses, such as big bluestem, Caucasian bluestem, and indiangrass. The rooting depth is moderate, and droughtiness is a problem during part of the growing season. Shallow-rooted species that can tolerate droughtiness should be selected for planting. Erosion is a hazard in areas that are tilled before they are seeded. Timely tillage and a quickly established ground cover help to prevent excessive erosion. The main management concerns are preventing overgrazing and maintaining a good stand. Overgrazing causes compaction, deterioration of the stand, and excessive runoff. Proper stocking rates, pasture rotation, deferred grazing, and applications of fertilizer help to keep the pasture in good condition.

This soil is suited to trees, but production is low because of droughtiness. The soil is best suited to short rotations for small wood products, such as fuelwood and posts, or long rotations for small logs. Drought-tolerant species, such as scarlet oak, shortleaf pine, and shagbark hickory, grow best. No other major hazards or limitations affect planting or harvesting.

This soil is suited to woodland wildlife habitat. The habitat can be improved by providing food, water, and cover in large tracts of mature woodland. Brushy thickets, which are created by clearing small areas, provide habitat diversity. The soil conditions favor the establishment of green browse areas, annual grain plots, and wild herbaceous plants. The soil is suitable for the development of small ponds, which can provide water in areas that are remote from perennial water supplies.

This soil is poorly suited to dwellings without basements and to sewage lagoons. It is generally unsuitable as a site for dwellings with basements and for septic tank absorption fields because of the depth to bedrock. The underlying igneous bedrock is a poor aquifer. Drilling a successful well in the bedrock depends on hitting a crack or seam that contains enough water to serve the dwelling. Wetness and the

shrink-swell potential are limitations on sites for dwellings without basements. Footings and foundations should be reinforced so that they can withstand the shrinking and swelling of the soil. Installing drain tiles helps to prevent the damage caused by excessive wetness. The depth to bedrock, seepage, and the slope are limitations on sites for sewage lagoons. A properly designed sewage lagoon or another disposal system, such as a mound system, can provide adequate waste treatment. Sealing the bottom of the lagoon helps to prevent contamination of the ground water. The site for the lagoon can be leveled, and enough soil to build the embankment can be borrowed.

Low strength and frost action are limitations on sites for local roads and streets. Strengthening the base with crushed rock or other suitable material helps to prevent the damage resulting from low strength. Roadside ditches minimize the damage caused by frost action.

The land capability classification is IIIe. The woodland ordination symbol is 2A.

4D—Knobtop silt loam, 3 to 12 percent slopes, very stony. This moderately deep, gently sloping to strongly sloping, moderately well drained soil is on mountainous ridgetops and peaks and in saddles between the peaks. Stones and boulders commonly cover 0.1 to 3.0 percent of the surface, but sizable areas do not have stones or boulders on the surface. Most areas are oval or elongated and range from about 10 to more than 200 acres in size.

Typically, the surface layer is dark grayish brown silt loam about 3 inches thick. The subsurface layer is yellowish brown silt loam about 3 inches thick. The subsoil is about 26 inches thick. The upper part is brown and strong brown silty clay loam; the next part is dark yellowish brown, mottled silty clay loam; and the lower part is grayish brown very cobbly silt loam. Hard igneous bedrock is at a depth of about 32 inches.

Included with this soil in mapping are areas of Delassus, Irondale, and Taumsauk soils and rock outcrop. Delassus soils are deep, are moderately well drained, and have a fragipan. They are in landscape positions similar to those of the Knobtop soil. Irondale soils have more than 35 percent rock fragments. They are on the steeper parts of the ridges. Taumsauk soils are shallow. They are in scattered areas throughout the unit. Rock outcrop also is in scattered areas. Included areas make up about 10 percent of the unit.

Permeability is moderately slow in the Knobtop soil. Surface runoff is medium. The available water capacity is low. Natural fertility and the content of organic matter also are low. The surface layer is friable. The rooting depth is limited by the underlying bedrock at a depth of about 32 inches. In some periods during winter and spring, a perched water table is above the bedrock. The subsoil has a moderate shrink-swell potential.

Most areas are forested and are somewhat inaccessible. This soil generally is unsuitable for cultivated crops and hay unless the stones and boulders are removed. Crop yields are low.

This soil is moderately well suited to some legumes, such as lespedeza and birdsfoot trefoil; to cool-season grasses, such as tall fescue and reed canarygrass; and to warm-season grasses, such as big bluestem, Caucasian bluestem, and indiangrass. It is moderately suited to most legumes. Shallow-rooted species that can tolerate droughtiness should be selected for planting. Erosion is a hazard in areas that are tilled before they are seeded. Timely tillage and a quickly established ground cover help to prevent excessive erosion. A pasture can be more easily established and managed in the less stony and bouldery areas. Controlled burning helps to establish a stand with a minimum of surface disturbance. Brush and weed control may be a continuing problem. Operating the equipment used to control brush and weeds is difficult because of the stones and boulders. Girdling, cutting, or applications of herbicide are needed. Proper stocking rates and pasture rotation help to prevent overgrazing, keep the pasture in good condition, control weeds, and help to control erosion.

This soil is suited to trees, but production is low because of droughtiness. The soil is best suited to short rotations for small wood products, such as fuelwood and posts. The equipment limitation is the only management concern. It is caused by the rockiness. Drought-tolerant species should be favored in the stands. Hand planting or direct seeding is needed. Logs can be yarded to logging roads that have been cleared of large stones and boulders.

This soil is best suited to woodland wildlife habitat. The existing vegetation consists mainly of an oak-hickory forest that in places is interspersed with shortleaf pine. In some openings or glades that include rock outcrop, shallow soils support forbs or native grasses, such as indiangrass and big bluestem. Some areas are suitable for the establishment of green browse, annual grain plots, and wild herbaceous plants.

This soil is poorly suited to dwellings without basements and to onsite waste disposal. It is generally unsuitable as a site for dwellings with basements because of the depth to bedrock. The underlying igneous bedrock is a poor aquifer. Drilling a successful well in the bedrock depends on hitting a crack or seam

that contains enough water to serve the dwelling. Wetness, the shrink-swell potential, and rockiness are limitations on sites for dwellings without basements. Footings and foundations should be reinforced so that they can withstand the shrinking and swelling of the soil. Installing tile drains helps to prevent the damage caused by excessive wetness. The stones and boulders can be removed. The depth to bedrock is a limitation on sites for septic tank absorption fields. A properly designed sewage lagoon or another disposal system, such as a mound system, can provide adequate waste treatment. The site for the lagoon can be leveled, and enough soil to build the embankment can be borrowed. Sealing the bottom of the lagoon helps to prevent contamination of the ground water.

Low strength and frost action are limitations on sites for local roads and streets. Strengthening the base with crushed rock or other suitable material helps to prevent the damage resulting from low strength. Roadside ditches minimize the damage caused by frost action.

The land capability classification is IVe. The woodland ordination symbol is 2X.

6C—Delassus silt loam, 3 to 9 percent slopes. This deep, gently sloping, moderately well drained soil is mainly on foot slopes in the uplands that commonly abut steep mountainous areas. A few stones and boulders cover less than 0.01 percent of the surface. Most areas are irregularly shaped and are about 20 to more than 300 acres in size.

Typically, the surface layer is very dark grayish brown silt loam about 2 inches thick. The subsurface layer is yellowish brown silt loam about 4 inches thick. The subsoil is brown silty clay loam about 23 inches thick. Below this is a fragipan of brittle loam. The upper 6 inches of the fragipan is grayish brown. The lower part to a depth of 60 inches or more is yellowish brown.

Included with this soil in mapping are areas of Killarney soils and rock outcrop. Killarney soils are very cobbly or very gravelly throughout. They are on mountain foot slopes. Included areas make up about 10 percent of the unit.

Permeability is moderately slow above the fragipan in the Delassus soil and very slow in the fragipan. Surface runoff is medium. The available water capacity is low. Natural fertility and the content of organic matter also are low. The surface layer is friable and can be easily tilled. The rooting depth is restricted by the fragipan at a depth of about 29 inches. In some periods during winter and spring, a perched water table is above the fragipan.

Most areas have been cleared and are used for pasture and hay. Many areas remain forested. This soil is suited to cultivated crops, hay, and pasture. It is best suited to small grain and drought-tolerant crops because of the low available water capacity.

The main management concerns in cultivated areas are keeping erosion to a minimum, reducing the hazard of drought, and maintaining tilth and fertility. Terraces, a system of conservation tillage that leaves protective amounts of crop residue on the surface, winter cover crops, and grassed waterways can reduce the hazard of erosion. Where terraces are constructed, the fragipan can hinder revegetation after construction. The depth of the terrace cut and the design of the terrace system should be adjusted so that infertile soil is not exposed in small areas. Because the soil is easily eroded, the terraces should be closely spaced or should be used in conjunction with a conservation tillage system. Some type of grade stabilization structure generally is needed in grassed waterways. Crop rotations in which grasses and legumes are grown in about 2 years out of 3 help to control erosion. Conservation tillage can increase the number of years in which cultivated crops are included in the rotation. Conservation tillage and additions of manure, lime, and fertilizer help to keep the soil in good tilth and maintain fertility.

This soil is moderately well suited to legumes, such as lespedeza and birdsfoot trefoil; to cool-season grasses, such as tall fescue and orchardgrass; and to warm-season grasses, such as big bluestem, Caucasian bluestem, and indiangrass. The rooting depth is only moderate, and droughtiness is a problem during part of the growing season. Shallow-rooted species that can tolerate droughtiness should be selected for planting. Erosion is a hazard in areas that are tilled before they are seeded. Timely tillage and a quickly established ground cover help to prevent excessive erosion. The main management concerns are preventing overgrazing and maintaining a good stand. Overgrazing causes compaction, deterioration of the stand, and excessive runoff. Proper stocking rates, pasture rotation, deferred grazing, and applications of fertilizer help to keep the pasture in good condition.

This soil is suited to trees. No major hazards or limitations affect planting or harvesting. Excessive rut formation and miring are problems when the soil is wet. The use of equipment should be delayed until the soil is dry. Adding gravel or other suitable material to the main logging roads helps to prevent excessive rut formation and miring.

This soil is suitable for building site development and some kinds of onsite waste disposal. The wetness and the shrink-swell potential are limitations on sites for dwellings. Installing tile drains helps to prevent the

damage caused by excessive wetness. Footings and foundations should be reinforced so that they can withstand the shrinking and swelling of the soil. The soil is generally unsuitable as a site for septic tank absorption fields because of the wetness and the very slow permeability in the fragipan. The depth to bedrock, seepage, and the slope are limitations on sites for sewage lagoons. A properly designed sewage lagoon or another disposal system, such as a mound system, can provide adequate waste treatment. The site for the lagoon can be leveled. Sealing the bottom of the lagoon helps to prevent contamination of the ground water.

Low strength and frost action are limitations on sites for local roads and steets. Strengthening the base with crushed rock or other suitable material helps to prevent the damage resulting from low strength. Roadside ditches help to lower the water table and thus minimize the damage caused by frost action.

The land capability classification is IIIe. The woodland ordination symbol is 3A.

6D—Delassus silt loam, 5 to 14 percent slopes, bouldery. This deep, moderately sloping and strongly sloping, moderately well drained soil is on ridges in the uplands that commonly abut steep mountainous areas. Stones and boulders commonly cover 0.01 to 0.1 percent of the surface. Most areas are elongated and are about 20 to more than 150 acres in size.

Typically, the surface layer is dark grayish brown silt loam about 7 inches thick. The subsurface layer is dark yellowish brown silt loam about 4 inches thick. The subsoil is yellowish brown silty clay loam about 14 inches thick. Below this is a fragipan. The upper part of the fragipan is light yellowish brown, brittle gravelly silt loam. The lower part is reddish yellow, brittle gravelly silty clay loam. Hard rhyolite bedrock is at a depth of about 50 inches. A few stones and boulders and rhyolite cobbles and pebbles are on and below the surface. In some areas red clay is below the fragipan.

Included with this soil in mapping are areas of Killarney soils and rock outcrop. Killarney soils are very cobbly or very gravelly throughout. They are on mountain foot slopes. Included areas make up about 5 percent of the unit.

Permeability is moderately slow above the fragipan in the Delassus soil and very slow in the fragipan. Surface runoff is medium. The available water capacity is low. Natural fertility and the content of organic matter also are low. The surface layer is friable, but it is too stony and bouldery to be tilled. The rooting depth is restricted by the fragipan at a depth of about 25 inches. In some periods during winter and spring, a perched water table is above the fragipan.

Most areas remain forested. Some areas have been cleared and are used for pasture. This soil is suited to pasture, but it generally is unsuitable for cultivated crops because the stones and boulders interfere with mowing and tillage and can cause equipment damage. Also, erosion and drought are severe hazards.

This soil is suited to some legumes, such as lespedeza and birdsfoot trefoil; to some cool-season grasses, such as tall fescue and reed canarygrass; and to warm-season grasses, such as big bluestem, Caucasian bluestem, and indiangrass. It is moderately suited to most legumes and cool-season grasses. Shallow-rooted species that can tolerate droughtiness should be selected for planting. Erosion is a hazard in areas that are tilled before they are seeded. Timely tillage and a quickly established ground cover help to prevent excessive erosion. The stones and boulders severely limit tillage. They can be removed. The main management concerns are preventing overgrazing and maintaining a good stand. Overgrazing causes compaction, deterioration of the stand, and excessive runoff. Proper stocking rates, pasture rotation, deferred grazing, and applications of fertilizer help to keep the pasture in good condition.

This soil is suited to trees. Large stones and boulders limit the use of equipment. Logs can be yarded to logging roads that have been cleared of the stones and boulders. Hand planting or direct seeding is needed.

This soil is suited to building site development and some kinds of onsite waste disposal. Wetness, the shrink-swell potential, and the slope are limitations on sites for dwellings without basements. The wetness is a limitation on sites for dwellings with basements. Installing tile drains and sealing basement walls help to prevent the damage caused by excessive wetness. Footings, foundations, and basement walls should be reinforced so that they can withstand the shrinking and swelling of the soil. Land leveling is needed on sites for dwellings. Also, the dwellings can be designed so that they conform to the natural slope of the land. The soil is generally unsuitable as a site for septic tank absorption fields because of the slope, the wetness, and the very slow permeability in the fragipan. A properly designed sewage lagoon or another disposal system, such as a mound system, can provide adequate waste treatment. Grading can modify the slope. Sealing the bottom of the lagoon helps to prevent contamination of the ground water.

Low strength, the slope, and frost action are limitations on sites for local roads and streets. Strengthening the base with crushed rock or other suitable material helps to prevent the damage resulting from low strength. Roads can be designed so that they conform to the natural slope of the land. Also, cutting and filling can modify the slope. Roadside ditches help to lower the water table and thus minimize the damage caused by frost action.

The land capability classification is IVe. The woodland ordination symbol is 3X.

9C—Viraton silt loam, 3 to 9 percent slopes. This deep, gently sloping and moderately sloping, moderately well drained soil is on foot slopes in the uplands. Areas are generally long and irregularly shaped and range from about 10 to more than 100 acres in size.

Typically, the surface layer is brown silt loam about 4 inches thick. The subsurface layer is yellowish brown silt loam about 4 inches thick. The upper 13 inches of the subsoil is strong brown and yellowish brown silty clay loam. The next 10 inches is grayish brown, mottled silty clay loam. The next 28 inches is a fragipan of yellowish brown, brittle very cherty silt loam. The lower part of the subsoil to a depth of about 71 inches or more is yellowish brown cherty silty clay. In some places the content of chert is less than 25 percent in the fragipan. In other places the soil is more sloping and contains more chert.

Included with this soil in mapping are areas of soils that do not have a fragipan. These soils are in landscape positions similar to those of the Viraton soil. They make up about 10 to 15 percent of the unit.

Permeability is moderate above the fragipan in the Viraton soil and very slow in the fragipan. Surface runoff is medium. The available water capacity is low. The surface layer is friable and can be easily tilled. Natural fertility and the content of organic matter are low. The rooting depth is restricted by the fragipan at a depth of about 31 inches. In some periods during winter and spring, a perched water table is above the fragipan. The shrink-swell potential is moderate below the fragipan.

Most areas have been cleared and are used for pasture and hay. Many of the more sloping areas remain forested. This soil is suited to cultivated crops, hay, and pasture. It is best suited to small grain and drought-tolerant crops because of the low available water capacity.

The main management concerns in cultivated areas are keeping erosion to a minimum, reducing the hazard of drought, and maintaining tilth and fertility. Terraces, a system of conservation tillage that leaves protective amounts of crop residue on the surface, winter cover crops, grassed waterways, and contour farming help to control erosion. Where terraces are constructed, the fragipan can hinder revegetation after construction. The depth of the terrace cut and the design of the terrace system should be adjusted so that infertile soil is not exposed in small areas. Because the soil is easily eroded, the terraces should be closely spaced or should be used in conjunction with a conservation tillage system. Some type of grade stabilization structure generally is needed in grassed waterways. Crop rotations in which grasses and legumes are grown in about 2 years out of 3 help to control erosion. Conservation tillage can increase the number of years in which cultivated crops are included in the rotation. Conservation tillage and additions of manure, lime, and fertilizer help to keep the soil in good tilth and maintain fertility.

This soil is moderately well suited to legumes, such as lespedeza and birdsfoot trefoil; to cool-season grasses, such as tall fescue and orchardgrass; and to warm-season grasses, such as big bluestem, Caucasian bluestem, and indiangrass. The rooting depth is moderate, and droughtiness is a problem during part of the growing season. Erosion is a major hazard in areas that are tilled before they are seeded. Timely tillage and a quickly established ground cover help to prevent excessive erosion. The main management concerns are preventing overgrazing and maintaining a good stand. Overgrazing causes compaction, deterioration of the stand, and excessive runoff. Proper stocking rates, pasture rotation, deferred grazing, and applications of fertilizer help to keep the pasture in good condition.

This soil is suited to trees. Seedling mortality and the hazard of windthrow are management concerns in areas where the fragipan is within a depth of 30 inches. Seedling mortality can be moderate because of the hazard of drought. Planting seedlings of a larger size than is typical or planting containerized nursery stock can increase the survival rate. Properly managing the stand helps to ensure natural regeneration. Shortleaf pine can be planted by direct seeding. The stands should be thinned less intensively and more frequently than the stands in areas where windthrow is less likely. Excessive rut formation and miring are problems when the soil is wet. The use of equipment can be delayed until the soil is dry. Adding gravel or other suitable

material to the main logging roads minimizes rut formation and miring. In places logging roads can be located on nearby soils that are less prone to rut formation and miring.

This soil is suited to woodland wildlife habitat. The habitat can be improved by providing food, water, and cover in large tracts of mature woodland. Brushy thickets, which are created by clearing small areas, provide habitat diversity. The soil conditions favor the establishment of green browse areas, annual grain plots, and wild herbaceous plants. The soil is suitable for the development of small ponds, which can provide water in areas that are remote from perennial water supplies.

This soil is suitable for building site development and some kinds of onsite waste disposal. Wetness is a limitation on sites for dwellings. Installing tile drains helps to prevent the damage caused by excessive wetness. The soil is generally unsuitable as a site for septic tank absorption fields because of the wetness and the very slow permeability in the fragipan. The wetness, the slope, and seepage are limitations on sites for sewage lagoons. A properly designed sewage lagoon or another disposal system, such as a mound system, can provide adequate waste treatment. The site for the lagoon can be leveled. Sealing the bottom of the lagoon helps to prevent contamination of the ground water.

The wetness and frost action are limitations on sites for local roads and streets. Roadside ditches help to lower the water table and thus minimize the damage caused by wetness and frost action.

The land capability classification is IIIe. The woodland ordination symbol is 3D.

10E—Killarney very cobbly silt loam, 14 to 50 percent slopes, rubbly. This deep, moderately steep to very steep, moderately well drained soil is on low side slopes and foot slopes in the mountains. The landscape commonly appears corrugated because numerous small ravines have incised the regolith. Stones and boulders cover 1 to 35 percent of the surface. Areas generally are long and narrow or irregularly shaped and in places circle an entire mountain. Most range from about 50 to more than 500 acres in size.

Typically, the surface layer is dark grayish brown very cobbly silt loam about 3 inches thick. The subsurface layer is brown very cobbly silt loam about 4 inches thick. The upper 29 inches of the subsoil is yellowish brown and strong brown very cobbly silt loam and silty clay loam and very gravelly silty clay loam. The lower 44 inches is a fragipan of brittle, light yellowish brown very gravelly silt loam.

Included with this soil in mapping are areas of the moderately deep, well drained Irondale soils. These soils are on upper slopes and in ravines. Also included are areas of rock outcrop and some areas where stone pavement covers steep drainageways. Included areas make up about 12 percent of the unit.

Permeability is moderately slow above the fragipan in the Killarney soil and very slow in the fragipan. Surface runoff is rapid. The available water capacity is low. Natural fertility and the content of organic matter also are low. The surface layer is friable but is too rocky to be tilled. The rooting depth is restricted by the fragipan. In some periods during winter and spring, a perched water table is above the fragipan. The subsoil has a moderate shrink-swell potential.

Most areas are forested. A few areas have been cleared and are used for pasture. This soil generally is unsuited to cultivated crops, pasture, and hay because of the slope and the rockiness of the surface. Some of the moderately steep slopes, however, can be cleared of stones and used for pasture. These slopes are moderately suited to legumes, such as crownvetch and lespedeza; to cool-season grasses, such as tall fescue; and to warm-season grasses, such as Caucasian bluestem and indiangrass. Shallow-rooted species that can tolerate droughtiness should be selected for planting. Erosion is a major hazard if the soil is tilled during seedbed preparation. The stones and boulders severely limit tillage unless they are removed.

This soil is suited to trees. The hazard of erosion, the equipment limitation, seedling mortality, and the hazard of windthrow are the major management concerns. The slope and the stoniness limit the kinds of equipment that can be used. Logging roads and trails can be established on the contour and cleared of large stones and boulders, and logs can be yarded uphill to logging trails in the steepest areas. Seeding trails and disturbed areas after harvesting is completed helps to keep erosion to a minimum. The seedling mortality caused by drought can be minimized by planting the larger seedlings or containerized nursery stock. The stands should be thinned less intensively and more frequently than the stands in areas where windthrow is less likely. In areas where the forest is mature, tree roots are able to intercept the seepage that this soil receives from the higher elevations. In most areas hand planting is needed. Shortleaf pine can be planted by direct seeding. Properly managing the stand helps to ensure natural regeneration.

This soil generally is unsuitable for building site development and onsite waste disposal because of the slope and the large stones.

The land capability classification is VIIs. The woodland ordination symbol is 3R.

11C—Lebanon silt loam, 3 to 9 percent slopes. This deep, gently sloping and moderately sloping, moderately well drained soil is on wide ridgetops and divides in the uplands. Areas generally are elongated or irregularly shaped and range from about 20 to more than 200 acres in size.

Typically, the surface layer is brown silt loam about 5 inches thick. The part of the subsoil above a fragipan is about 20 inches of strong brown silt loam, brown silty clay loam, and grayish brown silty clay and silty clay loam. The fragipan is about 20 inches of pale brown, brittle extremely cherty silt loam and yellowish brown, brittle cherty silty clay loam. The lower part of the subsoil to a depth of 60 inches or more is yellowish brown cherty silty clay. In some eroded areas the surface layer is brown silty clay loam.

Included with this soil in mapping are areas of Wilderness soils. These soils contain more chert than the Lebanon soil. They are in landscape positions similar to those of the Lebanon soil. They make up about 5 percent of the unit.

Permeability is moderately slow above the fragipan in the Lebanon soil and very slow in the fragipan. Surface runoff is medium. The available water capacity is low. The surface layer is friable and can be easily tilled. Natural fertility and the content of organic matter are low. The rooting depth is restricted by the fragipan at a depth of about 25 inches. In some periods during winter and spring, a perched water table is above the fragipan. The shrink-swell potential is moderate.

Most areas have been cleared and are used for pasture and hay. Many areas remain forested. This soil is suited to cultivated crops, hay, and pasture. It is best suited to small grain and drought-tolerant crops because of the low available water capacity.

The main management concerns in cultivated areas are keeping erosion to a minimum, reducing the hazard of drought, and maintaining tilth and fertility. Terraces, a system of conservation tillage that leaves protective amounts of crop residue on the surface, winter cover crops, grassed waterways, and contour farming help to control erosion. Where terraces are constructed, the fragipan can hinder revegetation. The depth of the terrace cut and the design of the terrace system should be adjusted so that infertile soil is not exposed in small areas. Because the soil is easily eroded, the terraces should be closely spaced or should be used in conjunction with a conservation tillage system. Some type of grade stabilization structure commonly is needed in grassed waterways. Crop rotations in which grasses and legumes are grown in about 2 years out of 3 help to control erosion. Conservation tillage can increase the number of years in which cultivated crops are included in the rotation. Conservation tillage and additions of manure, lime, and fertilizer help to keep the soil in good tilth and maintain fertility.

This soil is moderately well suited to legumes, such as lespedeza and birdsfoot trefoil; to cool-season grasses, such as tall fescue and orchardgrass; and to warm-season grasses, such as big bluestem, Caucasian bluestem, and indiangrass. The rooting depth is moderate, and droughtiness is a problem during part of the growing season. Shallow-rooted species that can tolerate droughtiness should be selected for planting. Erosion is a hazard in areas that are tilled before they are seeded. Timely tillage and a quickly established ground cover help to prevent excessive erosion. The main management concerns are preventing overgrazing and maintaining a good stand. Overgrazing causes compaction, deterioration of the stand, and excessive runoff. Proper stocking rates, pasture rotation, deferred grazing, and applications of fertilizer help to keep the pasture in good condition.

This soil is suited to trees. Windthrow is a hazard. The stands should be thinned less intensively and more frequently than the stands in areas where windthrow is less likely. Excessive rut formation and miring are problems when the soil is wet. The use of equipment can be delayed until the soil is dry. Adding gravel or other suitable material to the main logging roads minimizes rut formation and miring. In places roads can be located on nearby soils that are less prone to rut formation and miring.

This soil is suited to woodland wildlife habitat. The habitat can be improved by providing food, water, and cover in large tracts of mature woodland. Brushy thickets, which are created by clearing small areas, provide habitat diversity. The soil conditions favor the establishment of green browse areas, annual grain plots, and wild herbaceous plants. The soil is suitable for the development of small ponds, which can provide water in areas that are remote from perennial water supplies.

This soil is suitable for building site development and some kinds of onsite waste disposal. Wetness and the shrink-swell potential are limitations on sites for dwellings. Installing tile drains helps to prevent the damage caused by excessive wetness. Footings,

foundations, and basement walls should be reinforced so that they can withstand the shrinking and swelling of the soil. The soil is generally unsuitable as a site for septic tank absorption fields because of the wetness and the very slow permeability in the fragipan. The slope is a limitation on sites for sewage lagoons. A properly designed sewage lagoon or another disposal system, such as a mound system, can provide adequate waste treatment. The site for the lagoon can be leveled.

Low strength, wetness, and frost action are limitations on sites for local roads and streets. Strengthening the base with crushed rock or other suitable material helps to prevent the damage resulting from low strength. Roadside ditches help to lower the water table and thus minimize the damage caused by wetness and frost action.

The land capability classification is IIIe. The woodland ordination symbol is 3D.

12E—Goss very cherty silt loam, 14 to 35 percent slopes. This deep, moderately steep and steep, well drained soil is on side slopes in the uplands. Most areas are broad and irregular in shape and range from about 50 to more than 2,000 acres in size.

Typically, the surface layer is dark grayish brown very cherty silt loam about 2 inches thick. The subsurface layer is light yellowish brown very cherty silt loam about 7 inches thick. The upper part of the subsoil is red very cherty silty clay about 8 inches thick; the next part is dark red very cherty clay about 11 inches thick; and the lower part to a depth of about 79 inches is dark red, mottled very cherty clay. In some places the subsoil is dark red throughout. In other places the surface layer is cherty.

Included with this soil in mapping are small areas of the moderately well drained Viraton and Wilderness soils. Viraton soils are on foot slopes. Wilderness soils are on ridgetops. Also included are areas of the somewhat excessively drained Gasconade and Midco soils. Gasconade soils are shallow over dolomite. They are on side slopes. Midco soils are cherty to extremely cherty throughout. They are on narrow flood plains. Included soils make up about 12 percent of the unit.

Permeability is moderate in the Goss soil. Surface runoff is rapid. The available water capacity is low. The surface layer is friable, but it is cherty enough to make tillage difficult. Natural fertility is low, and the content of organic matter is moderately low. The subsoil has a moderate shrink-swell potential. The number of roots decreases gradually with increasing depth. The soil has few roots below a depth of about 3 feet.

Most areas are forested. A few of the moderately steep areas are used for pasture. Because of the slope, the cherty surface layer, and the hazard of drought, this soil generally is unsuitable for cultivated crops and hay. It is moderately suited to legumes, such as crownvetch and lespedeza; to cool-season grasses, such as tall fescue; and to warm-season grasses, such as Caucasian bluestem and indiangrass. Droughtiness, erosion, and the chert fragments in the surface layer are the main management problems in pastured areas. Tillage should be avoided. A pasture can be more easily established and managed in the moderately steep areas. Minimizing surface disturbance during seedbed preparation can help to control erosion while a stand is becoming established. One means of minimizing surface disturbance is controlled burning. Brush and weed control may be a continuing problem. Operating the equipment used to control brush and weeds is difficult because of the slope. Girdling, cutting, or applications of herbicide are needed. Proper stocking rates and pasture rotation help to prevent overgrazing, keep the pasture in good condition, control weeds, and help to control erosion.

This soil is suited to trees. In many areas shortleaf pine and mixed hardwoods grow on the south- and west-facing slopes. Hardwoods, such as white oak and northern red oak, grow on the north- and east-facing slopes. The hazard of erosion, the equipment limitation, and seedling mortality are management concerns. Seeding trails and disturbed areas after harvesting is completed helps to keep erosion to a minimum. The slope limits the use of equipment. Logging roads and trails can be established on the contour, and logs can be yarded uphill or downhill to logging trails in the steepest areas. The seedling mortality caused by drought can be minimized by planting the larger seedlings or containerized nursery stock. In most areas hand planting is needed. Shortleaf pine can be planted by direct seeding. Properly managing the stand helps to ensure natural regeneration.

This soil is suited to woodland wildlife habitat. The habitat can be improved by providing food, water, and cover in large tracts of mature woodland. Brushy thickets, which are created by clearing small areas, provide habitat diversity. Food plots or green browse can be planted along logging roads and trails and in other openings. The soil is suitable for the development of small ponds, which can provide water in areas that are remote from perennial water supplies.

This soil generally is unsuitable for building site development and onsite waste disposal because of the slope.

The land capability classification is VIIe. The woodland ordination symbol is 3R.

13F—Clarksville very cherty silt loam, 25 to 50 percent slopes. This deep, steep and very steep, somewhat excessively drained soil is on side slopes in the uplands. Stones and boulders commonly cover less than 0.01 percent of the surface. Most areas are broad and irregular in shape and range from about 50 to a few thousand acres in size.

Typically, the surface layer is dark brown very cherty silt loam about 3 inches thick. The subsurface layer is pale brown very cherty silt loam about 13 inches thick. The subsoil is about 52 inches thick. The upper part is brown very cherty silt loam; the next part is strong brown very cherty silty clay loam; and the lower part is yellowish red, mottled very cherty clay.

Included with this soil in mapping are small areas of the moderately well drained Lebanon and Wilderness soils. These soils are on narrow ridgetops and foot slopes. They have a fragipan. Also included are areas of the well drained Goss soils and areas of Midco soils. Goss soils have more clay in the upper part of the subsoil than the Clarksville soil. They are on low side slopes. Midco soils have less clay in the subsoil than the Clarksville soil. They are nearly level or gently sloping and are on narrow flood plains. Included soils make up about 10 to 15 percent of the unit.

Permeability is moderately rapid in the upper part of the Clarksville soil and moderate in the lower part. Surface runoff is rapid. The available water capacity is low. Natural fertility and the content of organic matter also are low. The surface layer is friable or very friable and has a large amount of chert. The number of roots decreases gradually with increasing depth. The soil has few roots below a depth of about 4 feet.

Most areas are forested. A few moderately steep areas are used for pasture. Because of the slope, the cherty surface layer, and droughtiness, this soil is unsuitable for cultivated crops and hay. It is moderately suited to legumes, such as crownvetch and lespedeza; to cool-season grasses, such as tall fescue; and to warm-season grasses, such as Caucasian bluestem and indiangrass. Droughtiness, erosion, and the chert fragments in the surface layer are the main management problems in pastured areas. Other management concerns are preventing overgrazing and maintaining a good stand. Overgrazing causes compaction, deterioration of the stand, and excessive runoff. Tillage should be avoided. Proper stocking rates, pasture rotation, deferred grazing, and applications of fertilizer help to keep the pasture in good condition.

This soil is suited to trees. In many areas shortleaf pine and mixed hardwoods grow on the south- and west-facing slopes. Hardwoods, such as white oak and northern red oak, grow on the north- and east-facing slopes. The hazard of erosion, the equipment limitation, and seedling mortality are the major management concerns. Seeding trails and disturbed areas after harvesting is completed helps to keep erosion to a minimum. The slope restricts the use of equipment. Logging roads and trails can be established on the contour, and logs can be yarded uphill or downhill to logging trails in the steepest areas. Seedling mortality can be high because of the hazard of drought. The mortality rate can be reduced by planting the larger seedlings or containerized nursery stock. In most areas hand planting is needed. Shortleaf pine can be planted by direct seeding. Properly managing the stand helps to ensure natural regeneration.

This soil is suited to woodland wildlife habitat. The habitat can be improved by providing food and cover in large tracts of mature woodland. Brushy thickets, which are created by clearing small areas, provide habitat diversity. Food plots or green browse can be planted along logging roads and trails and in other openings.

This soil generally is unsuitable for building site development and onsite waste disposal because of the slope.

The land capability classification is VIIe. The woodland ordination symbol is 3R.

18C—Courtois silt loam, 3 to 9 percent slopes. This deep, gently sloping and moderately sloping, well drained soil is on ridgetops, side slopes, and foot slopes in the uplands. Most areas are broad and irregular in shape and range from about 15 to more than 200 acres in size.

Typically, the surface layer is dark brown silt loam about 3 inches thick. The subsoil extends to a depth of 60 inches or more. The upper part is a transitional layer of reddish brown silt loam. The next part is yellowish red silty clay loam. The lower part is dark red very cherty clay and clay. In places the subsoil is mottled below a depth of 2 feet. In some small areas the topsoil has been removed.

Included with this soil in mapping are small areas of the moderately well drained Gatewood soils. These soils are in landscape positions similar to those of the Courtois soil. Also included are some scattered areas where the surface layer is cherty and some scattered small seeps and wet areas. Included areas make up about 10 percent of the unit.

Permeability is moderate in the Courtois soil. Surface

runoff is medium. The available water capacity is moderate. The surface layer is friable and can be easily tilled. Natural fertility is medium, and the content of organic matter commonly is moderately low. The number of roots decreases gradually with increasing depth. The soil has few roots below a depth of about 3 feet. The subsoil has a moderate shrink-swell potential.

Most areas have been cleared and are used for pasture and hay. Many areas remain forested. This soil is suited to cultivated crops, hay, and pasture. The main management concerns are keeping erosion to a minimum and maintaining tilth and fertility. Terraces and a system of conservation tillage that leaves crop residue on the surface help to control erosion. Because the soil is easily eroded, the terraces should be closely spaced or should be used in conjunction with a conservation tillage system. Crop rotations in which grasses and legumes are grown in about 2 years out of 3 help to control erosion. Conservation tillage can increase the number of years in which cultivated crops are included in the rotation. Conservation tillage and additions of manure, lime, and fertilizer help to keep the soil in good tilth and maintain fertility.

This soil is well suited to most of the commonly grown legumes, such as alfalfa and red clover; to cool-season grasses, such as smooth brome and orchardgrass; and to warm-season grasses, such as big bluestem, indiangrass, and switchgrass. No serious problems affect pasture or hayland. Erosion is a hazard in areas that are tilled before they are seeded. Timely tillage and a quickly established ground cover help to prevent excessive erosion. The main management concerns are preventing overgrazing and maintaining a good stand. Overgrazing causes compaction, deterioration of the stand, and excessive runoff. Proper stocking rates, pasture rotation, deferred grazing, and applications of fertilizer help to keep the pasture in good condition.

This soil is well suited to trees. No major hazards or limitations affect planting, harvesting, or tree growth.

This soil is suitable for building site development and onsite waste disposal. The shrink-swell potential is a limitation on sites for dwellings. Footings, foundations, and basement walls should be reinforced so that they can withstand the shrinking and swelling of the soil. The moderate permeability in the subsoil is a limitation on sites for septic tank absorption fields. Enlarging the absorption field helps to overcome this limitation. If this measure is not practical, a site for a sewage lagoon can be leveled. Sealing the bottom of the lagoon helps to prevent contamination of the ground water.

Low strength, the shrink-swell potential, and frost action are limitations on sites for local roads and streets. Strengthening the base with crushed rock or other suitable material helps to prevent the damage resulting from low strength and from shrinking and swelling of the soil. Roadside ditches minimize the damage caused by frost action.

The land capability classification is IIIe. The woodland ordination symbol is 3A.

18D—Courtois silt loam, 9 to 14 percent slopes. This deep, strongly sloping, well drained soil is on side slopes and foot slopes in the uplands. Most areas are elongated and range from about 15 to more than 100 acres in size.

Typically, the surface layer is very dark grayish brown silt loam about 2 inches thick. The subsoil extends to a depth of 60 inches or more. The upper part is a transitional layer of dark brown silt loam. The next part is reddish brown silty clay. The lower part is dark red, mottled very cherty clay and clay. In places the subsoil is mottled below a depth of 2 feet.

Included with this soil in mapping are small areas of the moderately well drained Gatewood soils. These soils are in landscape positions similar to those of the Courtois soil. Also included are areas of rock outcrop or ledges, small seeps, and wet areas. Included areas make up about 10 percent of the unit.

Permeability is moderate in the Courtois soil. Surface runoff is rapid. The available water capacity is moderate. The surface layer is friable and generally can be easily tilled. In some areas, however, it is cherty. Natural fertility is medium, and the content of organic matter commonly is moderately low. The number of roots decreases gradually with increasing depth. The soil has few roots below a depth of about 3 feet. The subsoil has a moderate shrink-swell potential.

Most areas have been cleared and are used for pasture and hay. Many areas remain forested. This soil is poorly suited to cultivated crops because of the hazard of erosion. Measures that maintain tilth and fertility are needed. Crop rotations in which grasses and legumes are grown in about 3 years out of 4 help to control erosion. Conservation tillage can increase the number of years in which cultivated crops are included in the rotation. Other measures that can help to control erosion are winter cover crops, grassed waterways, and contour farming. Terracing is not practical because of the slope. Conservation tillage and additions of manure, lime, and fertilizer help to keep the soil in good tilth and maintain fertility.

This soil is well suited to most of the commonly grown legumes, such as alfalfa, ladino clover, and red

clover; to cool-season grasses, such as tall fescue and timothy; and to warm-season grasses, such as big bluestem and switchgrass. Erosion is a hazard in areas that are tilled before they are seeded. Timely tillage and a quickly established ground cover help to prevent excessive erosion. The main management concerns are preventing overgrazing and maintaining a good stand. Overgrazing causes compaction, deterioration of the stand, and excessive runoff. Measures that maintain fertility and brush control are necessary. Proper stocking rates, pasture rotation, deferred grazing, and applications of fertilizer help to keep the pasture in good condition.

This soil is well suited to trees. No major hazards or limitations affect planting, harvesting, or tree growth.

This soil is suitable for building site development and onsite waste disposal. The shrink-swell potential and the slope are limitations on sites for dwellings. Footings, foundations, and basement walls should be reinforced so that they can withstand the shrinking and swelling of the soil. Land grading can modify slope. The moderate permeability in the subsoil is a limitation on sites for septic tank absorption fields. Enlarging the absorption field helps to overcome this limitation. If this measure is not practical, a site for a sewage lagoon can be leveled. Sealing the bottom of the lagoon helps to prevent contamination of the ground water.

Low strength, the shrink-swell potential, and frost action are limitations on sites for local roads and streets. Strengthening the base with crushed rock or other suitable material helps to prevent the damage resulting from low strength and from shrinking and swelling of the soil. Roadside ditches minimize the damage caused by frost action.

The land capability classification is IVe. The woodland ordination symbol is 3A.

19B—Crider silt loam, 2 to 5 percent slopes. This deep, gently sloping, well drained soil is on the tops of ridges in the uplands. Most areas are irregular in shape and range from about 20 to more than 200 acres in size.

Typically, the surface layer is dark brown silt loam about 7 inches thick. The subsoil extends to a depth of 72 inches or more. The upper part is dark brown silt loam, the next part is strong brown and yellowish red silty clay loam, and the lower part is yellowish red clay. In a few eroded areas, the surface layer is silty clay loam. In some areas the lower part of the subsoil has gray or olive mottles.

Included with this soil in mapping are areas of the moderately well drained Fourche soils. These soils are in landscape positions similar to those of the Crider soil. They make up about 10 percent of the unit.

Permeability is moderate in the Crider soil. Surface runoff is medium. The available water capacity is high. The surface layer is friable and can be easily tilled. Natural fertility is medium, and the content of organic matter is moderately low. The number of roots decreases gradually with increasing depth. The soil has few roots below a depth of about 3 feet.

Most areas have been cleared and are used for pasture and hay. This soil is well suited to cultivated crops, hay, and pasture. The main management concerns are keeping erosion to a minimum, minimizing compaction, and maintaining tilth and fertility. A system of conservation tillage that leaves protective amounts of crop residue on the surface, winter cover crops, terraces and grassed waterways, and contour farming help to control erosion. No limitations affect terracing. Crop rotations in which grasses and legumes are grown in about 2 years out of 4 help to control erosion. Conservation tillage can increase the number of years in which cultivated crops are included in the rotation. Plowpans or traffic pans form readily in cultivated fields. Subsoiling or chiseling and reducing the number of trips over the field help to maintain favorable rooting conditions. Conservation tillage and additions of manure, lime, and fertilizer help to keep the soil in good tilth and maintain fertility.

This soil is well suited to most of the commonly grown legumes, such as alfalfa and red clover; to cool-season grasses, such as smooth brome and orchardgrass; and to warm-season grasses, such as big bluestem, indiangrass, and switchgrass. No serious problems affect pasture or hayland. Erosion is a hazard in areas that are tilled before they are seeded. Timely seedbed preparation helps to ensure a good ground cover. The main management concerns are preventing overgrazing and maintaining a good stand. Overgrazing causes compaction, deterioration of the stand, and excessive runoff. Proper stocking rates, pasture rotation, deferred grazing, and applications of fertilizer help to keep the pasture in good condition.

Where this soil is used for pond reservoir areas, excessive seepage is a common problem because of porous, aggregated clay. A dispersing agent, such as soda ash, or other special treatment can seal the reservoir.

Some areas support native hardwoods. This soil is well suited to trees and orchards. Woodlots should be protected against grazing and trampling by livestock. No major hazards or limitations affect planting or harvesting.

This soil is suitable for building site development and onsite waste disposal. No major limitations affect dwellings or septic tank absorption fields.

Low strength and frost action are limitations on sites for local roads and streets. Strengthening the base with crushed rock or other suitable material helps to prevent the damage resulting from low strength. Roadside ditches minimize the damage caused by frost action.

The land capability classification is IIe. The woodland ordination symbol is 4A.

19C—Crider silt loam, 5 to 9 percent slopes. This deep, moderately sloping, well drained soil is on ridges in the uplands. Most areas are irregular in shape and range from about 20 to more than 200 acres in size.

Typically, the surface layer is dark yellowish brown silt loam about 7 inches thick. The upper part of the subsoil is reddish brown silty clay loam, and the lower part to a depth of about 60 inches is yellowish red silty clay. In some eroded areas, the silt loam surface layer has been completely removed and the present plow layer is silty clay loam.

Included with this soil in mapping are areas of the moderately well drained Fourche soils. These soils are in landscape positions similar to those of the Crider soil. They make up about 5 percent of the unit.

Permeability is moderate in the Crider soil. Surface runoff is medium. The available water capacity is high. The surface layer is friable and can be easily tilled. Natural fertility is medium, and the content of organic matter is moderately low unless the soil is eroded. The number of roots decreases gradually with increasing depth. The soil has few roots below a depth of about 3 feet.

Most areas have been cleared and are used for pasture and hay. This soil is suited to cultivated crops, hay, and pasture. The main management concerns are controlling erosion, minimizing compaction, and maintaining tilth and fertility. A system of conservation tillage that leaves protective amounts of crop residue on the surface, winter cover crops, terraces and grassed waterways, and contour farming help to control erosion. Some type of grade stabilization structure may be needed in grassed waterways. No limitations affect terracing. Crop rotations in which grasses and legumes are grown in about 2 years out of 3 help to control erosion. Conservation tillage can increase the number of years in which cultivated crops are included in the rotation. Plowpans or traffic pans form readily in cultivated fields. Subsoiling or chiseling and reducing the number of trips over the field help to maintain favorable rooting conditions. Conservation tillage and additions of manure, lime, and fertilizer help to keep the soil in good tilth and maintain fertility.

This soil is well suited to most of the commonly grown legumes, such as alfalfa and red clover; to cool-season grasses, such as smooth brome and orchardgrass; and to warm-season grasses, such as big bluestem, indiangrass, and switchgrass. No serious problems affect pasture or hayland. Erosion is a hazard in areas that are tilled before they are seeded. Timely seedbed preparation helps to ensure a good ground cover. The main management concerns are preventing overgrazing and maintaining a good stand. Overgrazing causes compaction, deterioration of the stand, and excessive runoff. Proper stocking rates, pasture rotation, deferred grazing, and applications of fertilizer help to keep the pasture in good condition.

Where this soil is used for pond reservoir areas, excessive seepage is a common problem because of porous, aggregated clay. A dispersing agent, such as soda ash, or other special treatment can seal the reservoir.

Some areas support native hardwoods. This soil is suited to trees and orchards. Woodlots should be protected against grazing and trampling by livestock. No major hazards or limitations affect planting or harvesting.

This soil is suitable for building site development and onsite waste disposal. No major limitations affect dwellings or septic tank absorption fields.

Low strength and frost action are limitations on sites for local roads and streets. Strengthening the base with crushed rock or other suitable material helps to prevent the damage resulting from low strength. Roadside ditches minimize the damage caused by frost action.

The land capability classification is IIIe. The woodland ordination symbol is 4A.

20B—Fourche silt loam, 2 to 5 percent slopes. This deep, gently sloping, moderately well drained soil is on broad ridges in the uplands. Most areas are irregular in shape and range from about 20 to more than 400 acres in size.

Typically, the surface layer is dark grayish brown silt loam about 5 inches thick. The subsurface layer is yellowish brown silt loam about 5 inches thick. The subsoil extends to a depth of about 65 inches. The upper part is strong brown silt loam and brown silty clay loam, the next part is brown silty clay loam that has coatings of light brownish gray silt loam, and the lower part is reddish brown and strong brown clay. In places the depth to bedrock is less than 60 inches.

Included with this soil in mapping are areas of the

well drained Crider soils and small areas of soils that have a fragipan. The included soils are in landscape positions similar to those of the Fourche soil. They make up about 15 percent of the unit.

Permeability is moderately slow in the Fourche soil. Surface runoff is medium. The available water capacity is high. The surface layer is friable and can be easily tilled. Natural fertility is moderately low, and the content of organic matter is low. The number of roots decreases gradually with increasing depth. The soil has few roots below a depth of about 3 feet. A perched water table is in the subsoil during winter and spring. It is at a depth of 1.5 to 3.0 feet in most years. The shrink-swell potential is moderate in the subsoil.

Most areas have been cleared and are used for pasture and hay. This soil is well suited to cultivated crops. The main management concerns are keeping erosion to a minimum, minimizing compaction, and maintaining tilth and fertility. Terraces, a system of conservation tillage that leaves protective amounts of crop residue on the surface, winter cover crops, grassed waterways, and contour farming help to control erosion. Because the soil is easily eroded, the terraces should be closely spaced or should be used in conjunction with a conservation tillage system. Some kind of grade stabilization structure is needed in grassed waterways. Crop rotations in which grasses and legumes are grown in about 1 year out of 3 help to control erosion. Conservation tillage can increase the number of years in which cultivated crops are included in the rotation. Plowpans or traffic pans form readily in cultivated fields. Subsoiling or chiseling and reducing the number of trips over the field help to maintain favorable rooting conditions. Conservation tillage and additions of manure, lime, and fertilizer help to keep the soil in good tilth and maintain fertility.

This soil is well suited to most of the commonly grown legumes, such as ladino clover and red clover; to cool-season grasses, such as smooth brome and orchardgrass; and to warm-season grasses, such as big bluestem, indiangrass, and switchgrass. No serious problems affect pasture or hayland. Erosion is a hazard in areas that are tilled before they are seeded. Timely seedbed preparation helps to ensure a good ground cover. The main management concerns are preventing overgrazing and maintaining a good stand. Overgrazing causes compaction, deterioration of the stand, and excessive runoff. Proper stocking rates, pasture rotation, deferred grazing, and applications of fertilizer help to keep the pasture in good condition.

Some areas support native hardwoods. This soil is suited to trees and orchards. Woodlots should be protected against grazing and trampling by livestock. No major hazards or limitations affect planting or harvesting.

This soil is suitable for building site development and some kinds of onsite waste disposal Wetness and the shrink-swell potential are limitations on sites for dwellings. Installing tile drains helps to prevent the damage caused by excessive wetness. Footings, foundations, and basement walls should be reinforced so that they can withstand the shrinking and swelling of the soil. The soil is generally unsuitable as a site for septic tank absorption fields because of the wetness and the moderately slow permeability. A properly designed sewage lagoon or another disposal system, such as a mound system, can provide adequate waste treatment. The site for the lagoon can be leveled. Sealing the bottom of the lagoon helps to prevent contamination of the ground water.

Low strength, wetness, and frost action are limitations on sites for local roads and streets. Strengthening the base with crushed rock or other suitable material helps to prevent the damage resulting from low strength. Roadside ditches help to lower the water table and thus minimize the damage caused by wetness and frost action.

The land capability classification is IIe. The woodland ordination symbol is 3A.

20C—Fourche silt loam, 5 to 9 percent slopes. This deep, moderately sloping, moderately well drained soil is on ridges and the upper side slopes in the uplands. Most areas are irregular in shape and range from about 20 to more than 200 acres in size.

Typically, the surface layer is dark brown silt loam about 7 inches thick. The subsoil extends to a depth of 60 inches or more. The upper part is yellowish brown silty clay loam, the next part is brown silty clay loam that has light brownish gray silt coatings, and the lower part is yellowish red, mottled silty clay. In some severely eroded areas, the surface layer is silty clay loam. In some places the depth to bedrock is less than 60 inches, and in other places the bedrock is sandstone rather than dolomite.

Included with this soil in mapping are small areas of soils that have a fragipan. These soils are in landscape positions similar to those of the Fourche soil. They make up about 10 percent of the unit.

Permeability is moderately slow in the Fourche soil. Surface runoff is medium. The available water capacity is high. The surface layer is friable and can be easily tilled unless it is severely eroded. Natural fertility is moderately low, and the content of organic matter is

low. The number of roots decreases gradually with increasing depth. The soil has few roots below a depth of about 3 feet. A perched water table is in the subsoil during winter and spring. It is at a depth of 1.5 to 3.0 feet in most years. The shrink-swell potential is moderate in the subsoil.

Most areas have been cleared and are used for pasture and hay. This soil is suited to cultivated crops. The main management concerns are keeping erosion to a minimum, minimizing compaction, and maintaining tilth and fertility. Terraces, a system of conservation tillage that leaves protective amounts of crop residue on the surface, winter cover crops, grassed waterways, and contour farming help to control erosion. Because the soil is easily eroded, the terraces should be closely spaced or should be used in conjunction with a conservation tillage system. Some type of grade stabilization structure generally is needed in grassed waterways. Crop rotations in which grasses and legumes are grown in about 2 years out of 3 help to control erosion. Conservation tillage can increase the number of years in which cultivated crops are included in the rotation. Plowpans or traffic pans form readily in cultivated fields. Subsoiling or chiseling and reducing the number of trips over the field help to maintain favorable rooting conditions. Conservation tillage and additions of manure, lime, and fertilizer help to keep the soil in good tilth and maintain fertility.

This soil is well suited to most of the commonly grown legumes, such as ladino clover and red clover; to cool-season grasses, such as smooth brome and orchardgrass; and to warm-season grasses, such as big bluestem, indiangrass, and switchgrass. No serious problems affect pasture or hayland. Erosion is a hazard in areas that are tilled before they are seeded. Timely seedbed preparation helps to ensure a good ground cover. The main management concerns are preventing overgrazing and maintaining a good stand. Overgrazing causes compaction, deterioration of the stand, and excessive runoff. Proper stocking rates, pasture rotation, deferred grazing, and applications of fertilizer help to keep the pasture in good condition.

Some areas support native hardwoods. This soil is suited to trees and orchards. Woodlots should be protected against grazing and trampling by livestock. No major hazards or limitations affect planting or harvesting.

This soil is suitable for building site development and some kinds of onsite waste disposal. Wetness and the shrink-swell potential are limitations on sites for dwellings. Installing tile drains helps to prevent the damage caused by excessive wetness. Footings, foundations, and basement walls should be reinforced so that they can withstand the shrinking and swelling of the soil. The soil is generally unsuitable as a site for septic tank absorption fields because of the wetness and the moderately slow permeability. A properly designed sewage lagoon or another disposal system, such as a mound system, can provide adequate waste treatment. The site for the lagoon can be leveled. Sealing the bottom of the lagoon helps to prevent contamination of the ground water.

Low strength, wetness, and frost action are limitations on sites for local roads and streets. Strengthening the base with crushed rock or other suitable material helps to prevent the damage resulting from low strength. Roadside ditches help to lower the water table and thus minimize the damage caused by wetness and frost action.

The land capability classification is IIIe. The woodland ordination symbol is 3A.

22D—Wilderness very cherty silt loam, 5 to 14 percent slopes. This deep, moderately sloping and strongly sloping, moderately well drained soil is on ridges in the uplands. Most areas are long and narrow and follow the irregular pattern of drainage divides. The areas range from about 20 to more than 1,000 acres in size.

Typically, the surface layer is dark grayish brown very cherty silt loam about 4 inches thick. The subsurface layer is brown and yellowish brown very cherty silt loam about 11 inches thick. The upper part of the subsoil is strong brown very cherty silty clay loam about 9 inches thick. The next part is a fragipan of yellowish brown very cherty silt loam about 26 inches thick. The lower part to a depth of 60 inches or more is strong brown very cherty silty clay loam. In places the fragipan is 3 or more feet thick.

Included with this soil in mapping are areas of Lebanon soils. These soils contain less chert than the Wilderness soil. They are on gently sloping ridgetops. They make up about 5 percent of the unit.

Permeability is moderate in the upper part of the subsoil in the Wilderness soil and slow in the fragipan. Surface runoff is medium. The available water capacity is very low. The content of organic matter and natural fertility are low. The surface layer is friable and has a large amount of chert gravel. The rooting depth is restricted by the fragipan at a depth of about 2 feet. In some periods during winter and spring, a perched water table is above the fragipan.

Most areas are forested. A few areas have been cleared and are used for pasture. This soil is unsuited

to cultivated crops and hay. It is moderately suited to legumes, such as crownvetch and lespedeza; to cool-season grasses, such as tall fescue; and to warm-season grasses, such as Caucasian bluestem and indiangrass. The main management concerns in pastured areas are the hazard of erosion, the cherty surface layer, the hazard of drought, and measures that maintain tilth and fertility. A pasture can be more easily established and managed in the less cherty areas. Girdling, cutting, or applications of herbicide are needed. Proper stocking rates and pasture rotation help to prevent overgrazing, keep the pasture in good condition, control weeds, and help to control erosion.

This soil is suited to trees. In many areas shortleaf pine and mixed hardwoods predominate. The hardwoods are mainly white oak and northern red oak. The windthrow hazard and seedling mortality are management concerns. The content of chert in the surface soil limits the use of mechanized planters. The stands should be thinned less intensively and more frequently than the stands in areas where windthrow is less likely. Seedling mortality can be high because of the hazard of drought. Planting the larger seedlings or containerized nursery stock increases the seedling survival rate. Hand planting is needed. Shortleaf pine can be planted by direct seeding. Properly managing the stand helps to ensure natural regeneration.

This soil is suited to woodland wildlife habitat. The habitat can be improved by providing food and cover in large tracts of native woodland. Brushy thickets, which are created by clearing small areas, provide habitat diversity. Food plots or green browse can be planted along logging roads and trails and in other openings.

This soil is suitable for building site development and some kinds of onsite waste disposal. Wetness and the slope are limitations on sites for dwellings. Installing tile drains helps to prevent the damage caused by excessive wetness. Land grading can modify the slope. The soil is generally unsuitable as a site for septic tank absorption fields because of the wetness and the slow permeability in the fragipan. A properly designed sewage lagoon or another disposal system, such as a mound system, can provide adequate waste treatment. The site for the lagoon can be leveled. Sealing the bottom of the lagoon helps to prevent contamination of the ground water.

The wetness, the slope, and frost action are limitations on sites for local roads and streets. Extensive cutting and filling can modify the slope. Roadside ditches help to lower the water table and thus minimize the damage caused by wetness and frost action.

The land capability classification is VIs. The woodland ordination symbol is 3D.

22E—Wilderness very cherty silt loam, 14 to 30 percent slopes. This deep, moderately steep and steep, moderately well drained soil is on side slopes in the uplands. Most areas are broad and irregular in shape and range from about 50 to more than 500 acres in size.

Typically, the surface layer is brown very cherty silt loam about 6 inches thick. The subsurface layer is yellowish brown very cherty silt loam about 10 inches thick. The upper part of the subsoil is yellowish red extremely cherty silty clay loam about 6 inches thick. The next part is a fragipan of reddish yellow very cherty silt loam about 11 inches thick. The lower part to a depth of 60 inches or more is strong brown and yellowish red extremely cherty silty clay.

Included with this soil in mapping are small areas of the somewhat excessively drained Clarksville soils. These soils are on very steep slopes. They make up about 15 percent of the unit.

Permeability is moderate in the upper part of the subsoil in the Wilderness soil and slow in the fragipan. Surface runoff is rapid. The available water capacity is very low. The content of organic matter and natural fertility are low. The surface layer is friable and has a large amount of chert gravel. The rooting depth is restricted by the fragipan at a depth of about 2 feet. In some periods during winter and spring, a perched water table is above the fragipan.

Most areas are forested. This soil is unsuited to cultivated crops and hay. It is moderately suited to legumes, such as crownvetch and lespedeza; to cool-season grasses, such as tall fescue; and to warm-season grasses, such as Caucasian bluestem and little bluestem. The main management concerns in pastured areas are the slope, the cherty surface layer, and the hazard of drought. A pasture can be more easily established and managed in the moderately steep areas. Minimizing surface disturbance during seedbed preparation can help to control erosion while a stand is becoming established. One means of minimizing surface disturbance is controlled burning. Brush and weed control may be a continuing problem. Operating the equipment used to control brush and weeds is difficult because of the slope. Girdling, cutting, or applications of herbicide are needed. Proper stocking rates and pasture rotation help to prevent overgrazing, keep the pasture in good condition, control weeds, and help to control erosion.

This soil is suited to trees. In many areas shortleaf

pine and mixed hardwoods grow on the south- and west-facing slopes. Hardwoods, mainly white oak and northern red oak, grow on the north- and east-facing slopes. The hazard of erosion, the equipment limitation, seedling mortality, and the hazard of windthrow are management concerns. Erosion generally occurs along logging trails. It can be controlled by seeding the trails after harvesting is completed. The slope restricts the use of equipment. Logging roads and trails can be established on the contour, and logs can be yarded uphill or downhill to logging trails in the steepest areas. The seedling mortality caused by drought can be minimized by planting the larger seedlings or containerized nursery stock. Hand planting is needed. Shortleaf pine can be planted by direct seeding. Properly managing the stand helps to ensure natural regeneration. The stands should be thinned less intensively and more frequently than the stands in areas where windthrow is less likely.

This soil is suited to woodland wildlife habitat. The habitat can be improved by providing food and cover in large tracts of native woodland. Brushy thickets, which are created by clearing small areas, provide habitat diversity. Food plots or green browse can be planted along logging roads and trails and in other openings.

This soil generally is unsuitable for building site development and onsite waste disposal because of the slope.

The land capability classification is VIIs. The woodland ordination symbol is 3R.

25A—Auxvasse silt loam, 0 to 3 percent slopes. This deep, nearly level and gently sloping, somewhat poorly drained soil is on stream terraces, benches, and valley floors well above the level of flooding. Most areas are oval or oblong and range from about 10 to more than 200 acres in size.

Typically, the surface layer is dark brown silt loam about 8 inches thick. The subsurface layer is brown silt loam about 8 inches thick. Below this is a transitional layer about 4 inches thick. This layer is brown silty clay mixed with light brownish gray silt loam. The subsoil is grayish brown silty clay about 13 inches thick. The substratum to a depth of about 60 inches is light brownish gray silty clay loam. In some places the clayey subsoil extends to a depth of 4 or 5 feet. In other places the substratum contains as much as 30 percent gravel.

Included with this soil in mapping are small areas of the moderately well drained Fourche and Wakeland soils. Fourche soils are less clayey in the upper part of the subsoil than the Auxvasse soil. They are in the higher, more sloping areas. Wakeland soils are silt loam throughout. They are in depressions or old channels. Included soils make up about 10 percent of the unit.

Permeability is very slow in the Auxvasse soil. Surface runoff is slow. The available water capacity is high. The surface layer is friable and can be easily tilled. Natural fertility and the content of organic matter are low. The number of roots decreases gradually with increasing depth. The soil has few, if any, roots below a depth of about 3 feet. A perched water table is in the subsoil during winter and spring. It is at a depth of 1 to 2 feet in most years. The subsoil has a high shrink-swell potential.

Most areas have been cleared and are used for cultivated crops, pasture, or hay. This soil is suited to cultivated crops. The main management concerns are keeping erosion to a minimum, reducing wetness, minimizing compaction, and maintaining tilth and fertility. A system of conservation tillage that leaves crop residue on the surface helps to control erosion. Diversions help to control the erosion caused by upland runoff in some areas. Crop rotations in which grasses and legumes are grown in about 1 year out of 3 help to control erosion on some fields. Conservation tillage can increase the number of years in which cultivated crops are included in the rotation. The soil commonly is wet later in the spring than other soils in the county. The wetness delays spring planting. Soybeans and grain sorghum, which are better suited to late planting than corn, are grown in most years. Tile drains can be used, but they require close spacing because of the very slow permeability. Plowpans or traffic pans form readily in cultivated fields. Subsoiling or chiseling and reducing the number of trips over the field help to maintain favorable rooting conditions. Conservation tillage and additions of manure, lime, and fertilizer help to maintain good tilth and fertility.

This soil is suited to some of the commonly grown legumes, such as ladino clover and red clover; to cool-season grasses, such as smooth brome and orchardgrass; and to warm-season grasses, such as big bluestem, indiangrass, and switchgrass. No serious problems affect pasture or hayland. Erosion is a hazard in areas that are tilled before they are seeded. Timely seedbed preparation helps to ensure a good ground cover. The main management concerns are preventing overgrazing and maintaining a good stand. Overgrazing or grazing when the soil is wet causes compaction, deterioration of the stand, and excessive runoff. Grazing should be deferred when the soil is wet. Because of frost heaving in winter, some winterkill is likely to occur in legumes with large taproots, such as alfalfa.

This soil is suited to trees. The equipment limitation,

seedling mortality, the windthrow hazard, and plant competition are management concerns. Equipment should be used only when the soil is dry or frozen. The seedling mortality rate can be reduced by planting the larger seedlings or containerized nursery stock. Ridging the soil and then planting on the ridges increase the seedling survival rate. The stands should be thinned less intensively and more frequently than the stands in areas where windthrow is less likely. Plant competition is moderate where seedlings are planted. It can be controlled by proper site preparation, prescribed burning, applications of herbicide, or cutting.

This soil is suited to building site development and some kinds of onsite waste disposal. The wetness and the shrink-swell potential are limitations on sites for dwellings with basements. Installing tile drains helps to prevent the damage caused by excessive wetness. Footings and foundations should be reinforced so that they can withstand the shrinking and swelling of the soil. The soil is generally unsuitable as a site for septic tank absorption fields because of the wetness and the very slow permeability. A properly designed sewage lagoon or another disposal system, such as a mound system, can provide adequate waste treatment. Sealing the bottom of the lagoon helps to prevent contamination of the ground water.

Low strength, the shrink-swell potential, the wetness, and frost action are limitations on sites for local roads and streets. Strengthening the base with crushed rock or other suitable material helps to prevent the damage resulting from low strength and from shrinking and swelling of the soil. Roadside ditches help to lower the water table and thus minimize the damage caused by wetness and frost action.

The land capability classification is IIIw. The woodland ordination symbol is 4W.

31A—Loughboro silt loam, 0 to 3 percent slopes. This deep, nearly level and gently sloping, poorly drained soil is on upland plateaus and mountain divides. Individual areas are irregularly shaped and range from about 15 to more than 60 acres in size.

Typically, the surface layer is dark grayish brown silt loam about 8 inches thick. The subsurface layer is yellowish brown silt loam about 3 inches thick. The upper 4 inches of the subsoil is grayish brown silty clay that has silt coatings and tongues of light brownish gray material. The lower part is grayish brown clay about 13 inches thick. The substratum to a depth of 60 inches or more is light brownish gray silty clay loam.

Permeability is slow. Surface runoff also is slow. The soil commonly receives a significant amount of runoff from the adjacent mountains. The available water capacity is high. The surface layer is friable, but it tends to crust easily or puddle after heavy rains. Natural fertility is low, and the content of organic matter is moderately low. A perched water table is in the subsoil during winter and spring. It is at a depth of 1 or 2 feet in most years. Root development is restricted by wetness and by low fertility in the lower layers. The subsoil has a high shrink-swell potential.

Most areas have been cleared and are used for cultivated crops, pasture, or hay. This soil is suited to cultivated crops. The main management concerns are controlling the scouring and deposition caused by runoff from the adjacent uplands, reducing wetness, minimizing compaction, reducing the hazard of erosion, and maintaining tilth and fertility. Diversion terraces can protect some fields against runoff from the adjacent uplands. The soil commonly is wet later in the spring than other soils in the county. The wetness delays spring planting. Soybeans and grain sorghum are better suited to late planting than corn. Plowpans or traffic pans form readily in cultivated fields. Subsoiling or chiseling and reducing the number of trips over the field help to maintain favorable rooting conditions. A system of conservation tillage that leaves crop residue on the surface helps to control erosion. Row crops can be grown year after year in most areas if about half of the residue is left on the surface. Terraces generally are not needed. Crop rotations in which grasses and legumes are grown in about 1 year out of 4 can help to control erosion. Conservation tillage and additions of manure, lime, and fertilizer help to keep the soil in good tilth and maintain fertility.

This soil is moderately well suited to pasture species that can tolerate wetness, such as birdsfoot trefoil, reed canarygrass, and switchgrass. It is moderately suited to shallow-rooted legumes, such as alsike clover, and to cool-season grasses, such as tall fescue. Erosion is a hazard in areas that are tilled before they are seeded. Timely tillage and a quickly established ground cover help to prevent excessive erosion. The main management concerns are preventing overgrazing and maintaining a good stand. Overgrazing or grazing when the soil is wet causes compaction, deterioration of the stand, and excessive runoff. Grazing should be deferred when the soil is too wet. Because of frost heaving in the winter, winterkill is likely to occur in legumes with large taproots.

Some areas support native timber. This soil is suited to trees. Plant competition, seedling mortality, the equipment limitation, and the windthrow hazard are management concerns. Plant competition can be

controlled by prescribed burning, applications of herbicide, or cutting. The seedling mortality rate can be reduced by planting the larger seedlings or containerized nursery stock. Ridging the soil and then planting on the ridges increase the seedling survival rate. Equipment should be used only when the soil is dry or frozen. The stands should be thinned less intensively and more frequently than the stands in areas where windthrow is less likely.

This soil is suitable for building site development and some kinds of onsite waste disposal. The wetness and the shrink-swell potential are limitations. Installing tile drains helps to prevent the damage caused by excessive wetness. Footings and foundations should be reinforced so that they can withstand the shrinking and swelling of the soil. The soil is generally unsuitable as a site for septic tank absorption fields because of the wetness and the slow permeability. A properly designed sewage lagoon can provide adequate waste treatment.

Low strength, the shrink-swell potential, the wetness, and frost action are limitations on sites for local roads and streets. Strengthening the base with crushed rock or other suitable material helps to prevent the damage resulting from low strength and from shrinking and swelling of the soil. Roadside ditches help to lower the water table and thus minimize the damage caused by wetness and frost action.

The land capability classification is IIIw. The woodland ordination symbol is 2W.

35C—Viburnum silt loam, 3 to 9 percent slopes. This deep, gently sloping and moderately sloping, somewhat poorly drained soil is on ridges in the uplands. Most areas are narrow and elongated and range from 10 to about 500 acres in size.

Typically, the surface layer is dark grayish brown silt loam about 3 inches thick. The subsurface layer is yellowish brown silt loam about 4 inches thick. The upper 13 inches of the subsoil is brown silty clay loam and cherty silty clay loam. The next 18 inches is brown very cherty silty clay. The lower part to a depth of 60 inches or more is red extremely cherty clay. In some areas the subsoil has more chert.

Included with this soil in mapping are small areas of Goss and Lebanon soils. The well drained Goss soils are on side slopes. They have more chert throughout the surface soil and subsoil than the Viburnum soil. The moderately well drained Lebanon soils are on wide ridges. They have a fragipan. Included soils make up about 15 percent of the unit.

Permeability is moderately slow in the Viburnum soil. Surface runoff is rapid. The available water capacity is low. The surface layer is friable, but chert hinders tillage in places. The content of organic matter and natural fertility are low. A perched water table is in the subsoil during winter and spring. It is at a depth of 1.5 to 2.5 feet in most years. The shrink-swell potential in the subsoil is high.

Most areas are forested. A few areas have been cleared and are used for pasture and hay. Because of the hazard of erosion and droughtiness, this soil generally is unsuitable for cultivated crops. It is well suited to legumes, such as crownvetch and lespedeza; to cool-season grasses, such as tall fescue; and to warm-season grasses, such as Caucasian bluestem and indiangrass. Droughtiness and erosion are management concerns in pastured areas. A seedbed should be prepared on the contour. Timely seedbed preparation helps to ensure a good ground cover. Minimum tillage or no-till planting should be considered. Measures that maintain fertility and brush control are necessary. Other management needs are measures that prevent overgrazing and maintain a good stand. Overgrazing causes compaction, deterioration of the stand, and excessive runoff. Proper stocking rates, pasture rotation, and deferred grazing help to keep the pasture in good condition.

This soil is suited to trees. Plant competition is a limitation where seedlings are planted. It can be controlled by proper site preparation, prescribed burning, applications of herbicide, or cutting.

This soil is suited to building site development and onsite waste disposal. The shrink-swell potential and wetness are severe limitations on sites for dwellings. Properly designing and reinforcing footings, foundations, and basement walls can help to prevent the structural damage caused by shrinking and swelling. Installing drain tiles and sealing basement walls help to prevent the damage caused by excessive wetness. The moderately slow permeability and the wetness are limitations on sites for septic tank absorption fields. Perimeter drains can lower the water table. A properly constructed mound system also can overcome the wetness. Lengthening the laterals helps to overcome the restricted permeability. Seepage and slope are limitations on sites for sewage lagoons. Grading can modify the slope. Sealing the bottom of the lagoon helps to prevent contamination of the ground water.

Low strength, the shrink-swell potential, and frost action are limitations on sites for local roads and streets. Strengthening the base with crushed rock or other suitable material helps to prevent the damage resulting from low strength and from shrinking and swelling. Roadside ditches lower the water table and

thus minimize the damage caused by frost action.

The land capability classification is IIIe. The woodland ordination symbol is 3A.

36B—Lowell silt loam, 2 to 5 percent slopes. This deep, gently sloping, moderately well drained soil is on ridgetops in the basins and valleys. Most areas are long and narrow and range from about 20 to more than 200 acres in size.

Typically, the surface layer is dark brown silt loam about 6 inches thick. The subsurface layer is yellowish brown silt loam about 4 inches thick. The subsoil is about 47 inches thick. The upper part is brown silty clay loam, and the lower part is dark brown and dark yellowish brown clay. Hard dolomite bedrock is at a depth of about 57 inches. In many places the lower part of the subsoil has grayish brown mottles.

Included with this soil in mapping are areas of the moderately deep Gatewood soils on side slopes. These soils make up about 10 percent of the unit.

Permeability is moderately slow in the Lowell soil. Surface runoff is medium. The available water capacity is moderate. The surface soil is friable and can be easily tilled. Natural fertility is medium, and the content of organic matter is moderately low. The number of roots decreases gradually with increasing depth. The soil has few roots below a depth of about 2.5 feet. A perched seasonal high water table is at a depth of 2.5 to 5.0 feet in winter and early spring. The subsoil has a moderate shrink-swell potential.

Most areas have been cleared and are used for pasture and hay. This soil is well suited to cultivated crops. The main management concerns are keeping erosion to a minimum and maintaining tilth and fertility. Terraces, a system of conservation tillage that leaves protective amounts of crop residue on the surface, winter cover crops, grassed waterways, and contour farming can reduce the hazard of erosion. Where terraces are constructed, the moderately slow permeability in the subsoil can hinder revegetation after construction. The depth of the terrace cut and the design of the terrace system should be adjusted so that infertile soil is not exposed in small areas. Because the soil is easily eroded, the terraces should be closely spaced or should be used in conjunction with a conservation tillage system. Some type of grade stabilization structure generally is needed in grassed waterways. Crop rotations in which grasses and legumes are grown in about 2 years out of 3 help to control erosion. Conservation tillage can increase the number of years in which cultivated crops are included in the rotation. Conservation tillage and additions of manure, lime, and fertilizer help to keep the soil in good tilth and maintain fertility.

This soil is well suited to most of the commonly grown legumes, such as ladino clover and lespedeza; to cool-season grasses, such as tall fescue and reed canarygrass; and to warm-season grasses, such as big bluestem, indiangrass, and switchgrass. The species that are tolerant of wetness grow best. Erosion is a hazard in areas that are tilled before they are seeded. Timely tillage and a quickly established ground cover help to prevent excessive erosion. The main management concerns are preventing overgrazing and maintaining a good stand. Overgrazing causes compaction, deterioration of the stand, and excessive runoff. Proper stocking rates, pasture rotation, deferred grazing, and applications of fertilizer help to keep the pasture in good condition.

Some areas support native hardwoods and eastern redcedar. This soil is suited to trees. Woodlots should be protected against grazing and trampling by livestock. Low strength moderately limits the use of equipment. The equipment should be used only when the soil is dry. Adding gravel or other suitable material to the main logging roads minimizes rut formation and miring.

This soil is suitable for building site development and some kinds of onsite waste disposal. Wetness and the depth to bedrock are limitations on sites for dwellings with basements. The shrink-swell potential is a limitation on sites for dwellings without basements. Installing tile drains helps to prevent the damage caused by excessive wetness. Ensuring that enough soil underlies footings and foundations helps to prevent the damage caused by uneven settlement. Footings, foundations, and basement walls should be reinforced so that they can withstand the shrinking and swelling of the soil. The soil is generally unsuitable as a site for septic tank absorption fields because of the wetness and the moderately slow permeability. A properly designed sewage lagoon or another disposal system, such as a mound system, can provide adequate waste treatment. The site for the lagoon can be leveled. Sealing the bottom of the lagoon helps to prevent contamination of the ground water.

Low strength, the shrink-swell potential, and frost action are limitations on sites for local roads and streets. Strengthening the base with crushed rock or other suitable material helps to prevent the damage resulting from low strength and from shrinking and swelling. Roadside ditches help to lower the water table and thus minimize the damage caused by frost action.

The land capability classification is IIe. The woodland ordination symbol is 4C.

41D—Gasconade flaggy silty clay loam, 5 to 20 percent slopes, extremely stony. This shallow, moderately sloping to moderately steep, somewhat excessively drained soil is on side slopes and a few ridges in the uplands. Areas of this soil are locally called "glades" or "cedar glades." Stones commonly cover about 10 percent of the surface. Most areas are irregular in shape and range from about 8 to more than 100 acres in size.

Typically, the surface layer is very dark grayish brown flaggy silty clay loam about 6 inches thick. The subsoil is very dark gray very flaggy silty clay about 12 inches thick. Hard dolomite bedrock is at a depth of about 18 inches. In some places the surface layer is flaggy clay loam. In other places the soil has less than 35 percent rock fragments.

Included with this soil in mapping are areas of the moderately deep Gatewood and deep Crider soils. These soils occur as small areas, most commonly on foot slopes. Also included are ledges of rock outcrop that form narrow steplike bands across the slope. Included areas make up about 10 percent of the unit.

Permeability is moderately slow in the Gasconade soil. Surface runoff is rapid. The available water capacity is very low. Natural fertility is moderately low, and the content of organic matter is moderate. The surface layer is very friable, but most areas cannot be tilled because of the stones and the shallowness to bedrock. The rooting depth is restricted by the bedrock at a depth of about 18 inches. Some roots grow deeper into the cracks and fractures in the bedrock. The shrink-swell potential is moderate.

Most areas support some native grasses and scattered eastern redcedar, upland oaks, and ash. The trees are used as fenceposts and firewood. This soil is unsuited to cultivated crops because of the surface stones, the rock outcrop, and a severe hazard of drought.

The native grasses can be managed by carefully controlled grazing. They include big bluestem, indiangrass, little bluestem, and sideoats grama. Other drought-tolerant species, such as tall fescue, alsike clover, and common lespedeza, can be seeded. Seedbed preparation and brush control are difficult because of the rough, stony surface and the slope. A pasture can be more easily established and managed in the less stony areas. Some large stones can be removed. The main management concerns are preventing overgrazing and maintaining a good stand. Because of the slope and the shallowness to bedrock, the soil is very susceptible to erosion and the stand can easily deteriorate. Overgrazing causes compaction, deterioration of the stand, and excessive runoff. Proper stocking rates, pasture rotation, deferred grazing, and applications of fertilizer help to keep the pasture in good condition.

This soil is poorly suited to trees. Because of low productivity, it is best suited to short rotations for small wood products, such as fuelwood and posts. The equipment limitation, seedling mortality, and the windthrow hazard are management concerns. Hand planting or direct seeding is needed. Logs can be yarded to logging roads that have been cleared of large stones. The seedling mortality caused by drought can be minimized by planting the larger seedlings or containerized nursery stock. Properly managing the stand helps to ensure natural regeneration. The stands should be thinned less intensively and more frequently than the stands in areas where windthrow is less likely.

Both woodland and openland wildlife frequent areas of this soil. These areas provide little food, water, and cover. The habitat can be improved by providing water and food plots in nearby areas. Brush piles and treetops can provide cover. Measures that protect the habitat against fire and overgrazing are needed.

Rugged hiking trails can provide limited opportunities for recreation in the unique ecological areas of this soil. Many unique plants and wildflowers and rare species of insects and reptiles are in these glades.

This soil generally is unsuitable for building site development and onsite waste disposal because of the large stones and the depth to bedrock.

The land capability classification is VIIs. The woodland ordination symbol is 2X.

42F—Irondale very cobbly silt loam, 15 to 40 percent slopes, rubbly. This moderately deep, moderately steep to very steep, well drained soil is on generally long, mountainous slopes. Stones and boulders commonly cover 15 to 50 percent of the surface. Areas are commonly elongated or oval and range from about 100 to more than 1,000 acres in size.

Typically, the surface layer is very dark grayish brown very cobbly silt loam about 3 inches thick. The subsurface layer is brown very cobbly silt loam about 5 inches thick. The subsoil is very cobbly silt loam about 32 inches thick. It is yellowish brown in the upper part and reddish brown and brown in the lower part. Rhyolite bedrock is at a depth of about 35 inches. On some north- and east-facing slopes, the upper 20 inches of the bedrock is weathered and can be penetrated to a greater depth by roots. In places the surface layer is cobbly.

Included with this soil in mapping are small areas of

Killarney, Knobtop, and Taumsauk soils. Killarney soils are deep and have a fragipan. They are on the lower slopes and on small ridges between drainageways. Knobtop soils have less than 35 percent rock fragments. They are on narrow ridges and in the less sloping areas in the mountains. Taumsauk soils are shallow. They are in scattered areas throughout the unit. Also included are outcrops of rhyolite and similar igneous rocks in glade areas on the upper side slopes. Included areas make up about 15 percent of the unit.

Permeability is moderate in the Irondale soil. Surface runoff is rapid. The available water capacity is low. Natural fertility also is low, and the content of organic matter is moderately low. The surface layer is friable, but it cannot be easily tilled because it commonly has 50 percent or more rock fragments. The rooting depth is limited by the hard bedrock. The shrink-swell potential is low.

Most areas are forested, except for the natural openings in the glades. Because of the slope, the rock fragments on the surface, and droughtiness, this soil is unsuitable for field crops, hay, and pasture. It is suited to trees. It is best suited to short rotations for small wood products, such as fuelwood and posts, in areas on south- and west-facing slopes, where productivity is low. Productivity is moderate on north- and east-facing slopes. The hazard of erosion, the equipment limitation, and seedling mortality are management concerns. Erosion generally occurs along logging trails. It can be controlled by seeding the trails after harvesting is completed. The slope and the rocky surface limit the use of equipment. Logging roads and trails can be established on the contour and cleared of large stones and boulders, and logs can be yarded to the logging trails. The seedling mortality caused by drought can be minimized by planting the larger seedlings or containerized nursery stock. Hand planting or direct seeding is needed. Properly managing the stand helps to ensure natural regeneration.

This soil is best suited to woodland wildlife habitat. Even though the opportunities for intensive habitat management are limited in most areas, the habitat provides food, water, cover, and nesting areas. The existing vegetation consists mainly of an oak-hickory forest interspersed with shortleaf pine in places. Glades in the included areas of Taumsauk soils are natural openings in the otherwise extensive forest. These shallow soils support various forbs and native grasses, such as sumac, coralberry, little bluestem, and indiangrass. Small ponds can provide water in areas that are remote from perennial water supplies.

This soil generally is unsuitable for building site development and onsite waste disposal because of the slope, the depth to bedrock, and the rockiness of the surface.

The land capability classification is VIIs. The woodland ordination symbol is 2X.

43E—Syenite silt loam, 10 to 25 percent slopes, extremely bouldery. This moderately deep, strongly sloping to steep, well drained soil is on smooth, convex side slopes in the uplands. Stones and boulders cover 3 to 15 percent of the surface. Most areas are irregular in shape and range from about 100 to more than 300 acres in size.

Typically, the surface layer is dark grayish brown silt loam about 2 inches thick. The subsurface layer is yellowish brown silt loam about 4 inches thick. The subsoil is about 25 inches thick. The upper part is strong brown silty clay loam, the next part is brown clay loam, and the lower part is pale brown gravelly clay loam. Hard red granite bedrock is at a depth of about 31 inches. In places the surface layer is gravelly silt loam.

Included with this soil in mapping are areas of a shallow, somewhat excessively drained soil and areas of rock outcrop. The included areas are in landscape positions similar to those of the Syenite soil. They make up about 10 percent of the unit.

Permeability is moderately slow in the Syenite soil. Surface runoff is rapid. The available water capacity is low. Natural fertility and the content of organic matter also are low. The surface layer is friable, but it is too stony and bouldery to be tilled. The rooting depth is restricted by the bedrock.

Most areas are forested. A few areas are used for pasture. Most of the pastured areas have slopes of less than 20 percent and have fewer stones and boulders than the forested areas. Because of the slope and the large rocks on the surface, this soil is unsuitable for cultivated crops and hay. It is suited to some legumes, such as lespedeza and birdsfoot trefoil; to some cool-season grasses, such as tall fescue and reed canarygrass; and to warm-season grasses, such as big bluestem, Caucasian bluestem, and indiangrass. It is moderately suited to most legumes and cool-season grasses. Shallow-rooted species that can tolerate droughtiness should be selected for planting. Erosion is a hazard in areas that are tilled before they are seeded. Timely tillage and a quickly established ground cover help to prevent excessive erosion. The stones and boulders interfere with tillage and can cause equipment damage. The main management concerns are preventing overgrazing and maintaining a good stand.

Overgrazing causes compaction, deterioration of the stand, and excessive runoff. Minimizing surface disturbance during seedbed preparation can help to control erosion while a stand is becoming established. One means of minimizing surface disturbance is controlled burning. Brush and weed control may be a continuing problem. Operating the equipment used to control brush and weeds is difficult because of the slope. Girdling, cutting, or applications of herbicide are needed. Proper stocking rates and pasture rotation help to prevent overgrazing, keep the pasture in good condition, control weeds, and help to control erosion.

This soil is suited to trees. Because of low productivity, it is best suited to short rotations for small wood products, such as fuelwood and posts. The hazard of erosion, the equipment limitation, and seedling mortality are management concerns. Erosion generally occurs along logging trails. It can be controlled by seeding the trails after harvesting is completed. The slope and the rocky surface restrict the kinds of equipment that can be used. Logging roads and trails can be established on the contour and cleared of large stones and boulders. Logs can be yarded to the logging trails. The seedling mortality caused by drought can be minimized by planting the larger seedlings or containerized nursery stock. Hand planting or direct seeding is needed. Properly managing the stand helps to ensure natural regeneration.

This soil is suited to woodland wildlife habitat. The habitat can be improved by providing food and cover in large tracts of native woodland. Brushy thickets, which are created by clearing small areas, provide habitat diversity. Food plots or green browse can be planted along logging roads and trails and in other openings.

This soil generally is unsuitable for building site development and onsite waste disposal because of the slope, the depth to bedrock, and the large stones.

The land capability classification is VIIe. The woodland ordination symbol is 2R.

45F—Taumsauk-Irondale-Rock outcrop complex, 15 to 40 percent slopes, rubbly. This map unit occurs as areas of moderately steep to very steep soils intermingled with areas of igneous outcrops. The unit is on mountainous slopes (fig. 6). The Taumsauk soil is shallow and somewhat excessively drained, and the Irondale soil is deep and well drained. Stones and boulders cover about 15 to 50 percent of the surface. Areas are elongated and range from about 10 to more than 150 acres in size. They are about 55 percent Taumsauk soil, 30 percent Irondale soil, and 15 percent Rock outcrop. The two soils and the Rock outcrop occur as areas so intricately mixed or so small that separating them in mapping is not practical.

Typically, the Taumsauk soil has a surface layer of very dark grayish brown very cobbly silt loam about 6 inches thick. The subsoil is about 10 inches thick. The upper part is dark brown very cobbly silt loam, and the lower part is dark yellowish brown very cobbly silty clay loam. Hard rhyolite bedrock is at a depth of about 16 inches. In places the surface layer is cobbly, gravelly, or very gravelly.

Typically, the Irondale soil has a surface layer of very dark grayish brown very cobbly silt loam about 4 inches thick and a subsurface layer of dark yellowish brown very cobbly silt loam about 5 inches thick. The subsoil is about 24 inches thick. The upper part is yellowish brown very cobbly silt loam, the next part is yellowish brown very gravelly silty clay loam, and the lower part is yellowish brown very cobbly silty clay loam. Hard rhyolite bedrock is at a depth of about 33 inches.

The Rock outcrop consists of igneous rock. A few waterways have a rock pavement consisting of closely packed igneous rock fragments. The pavement has a smooth surface and supports no vegetation.

Permeability is moderate in the Taumsauk and Irondale soils. Surface runoff is very rapid on the Taumsauk soil and rapid on the Irondale soil. The available water capacity is very low in the Taumsauk soil and low in the Irondale soil. Natural fertility is low in both soils, and the content of organic matter is moderately low. The surface layer is friable, but it cannot be easily tilled because it commonly has 50 percent rock fragments. The rooting depth is limited by the hard bedrock. The shrink-swell potential is low.

Most areas are open glades interspersed with small areas of scrubby forest. Because of the slope, the rock fragments on the surface, and droughtiness, the Taumsauk and Irondale soils are unsuitable for cultivated crops, hay, pasture, and trees. They are best suited to woodland wildlife habitat. Even though the opportunities for intensive habitat management are limited in most areas, the habitat can provide food, water, cover, and nesting areas. The existing vegetation in the glades, where the Taumsauk soil is dominant, includes sumac, coralberry, little bluestem, and indiangrass. The small wooded areas consist mainly of an oak-hickory forest with some scattered pine. The forbs and native grasses that grow in the glades diversify the food supply of the region. They are inhabited by grasshoppers and other insects and thus are favorite feeding areas for wild turkeys.

These soils have potential for rugged hiking trails. The glades are natural openings in an otherwise

Figure 6.—An area of the Taumsauk-Irondale-Rock outcrop complex, 15 to 40 percent slopes, in a glade on the side of a mountain.

extensive forest. They are places to get compass bearings and vantage points for spectacular scenic views. These unique ecological areas have many rare species of plants, wild flowers, reptiles, and insects.

These soils generally are not suitable for building site development or onsite waste disposal because of the slope, the large stones, and the depth to bedrock.

The land capability classification is VIIs. The woodland ordination symbol assigned to the Irondale soil is 2X. The Taumsauk soil and Rock outcrop are not assigned a woodland ordination symbol.

52B—Secesh silt loam, 1 to 4 percent slopes. This deep, nearly level and gently sloping, well drained soil is on stream terraces. It is subject to rare flooding of brief duration. Most areas are oval or elongated and are about 5 to more than 200 acres in size.

Typically, the surface layer is brown silt loam about 7 inches thick. The subsoil extends to a depth of 60 inches or more. The upper part is dark brown silt loam; the next part is strong brown silty clay loam; and the lower part is dark yellowish brown extremely cherty sandy clay. In some places the surface layer is loam. In

other places it is thick and dark. In some areas it has more chert. In other areas the subsoil has less sand.

Included with this soil in mapping are areas of the somewhat excessively drained Midco soils. These soils are in narrow areas adjacent to the stream channels. Also included are some areas of Secesh soils that either are occasionally flooded or are not subject to flooding. Included soils make up about 10 percent of the unit.

Permeability is moderate in the Secesh soil. Surface runoff is slow. The available water capacity is low. The surface layer is friable and can be easily tilled. Natural fertility is medium, and the content of organic matter is moderately low. The number of roots decreases gradually with increasing depth. The soil has few roots below a depth of about 3 feet.

Most areas have been cleared and are used for pasture and hay. Some areas are cropped. A few remain forested. This soil is suited to cultivated crops, hay, and pasture. It is best suited to small grain and drought-tolerant crops because of the low available water capacity. The main management concerns are reducing the hazards of drought and erosion, minimizing compaction, and maintaining tilth and fertility. Some areas are subject to the scouring and deposition caused by runoff from the adjacent uplands. Crop residue management helps to maintain the content of organic matter and tilth and increases the rate of water infiltration. Plowpans or traffic pans form readily in cultivated fields. Subsoiling or chiseling and reducing the number of trips over the field help to maintain favorable rooting conditions. Diversions can protect this soil against the runoff from the adjacent uplands.

This soil is suited to most of the commonly grown legumes, such as alfalfa and red clover; to cool-season grasses, such as tall fescue and reed canarygrass; and to warm-season grasses, such as Caucasian bluestem and switchgrass. Droughtiness and erosion are the main problems. Species that can tolerate drought should be selected for planting. Erosion is a hazard in areas that are tilled before they are seeded. Timely tillage and a quickly established ground cover help to prevent excessive erosion. The main management concerns are preventing overgrazing and maintaining a good stand. Overgrazing causes compaction, deterioration of the stand, and excessive runoff. Proper stocking rates, pasture rotation, deferred grazing, and applications of fertilizer help to keep the pasture in good condition.

This soil is suited to trees. No major hazards or limitations affect planting or harvesting.

This soil generally is unsuitable for building site development and most kinds of onsite waste disposal because of the flooding. It is moderately suited to septic tank absorption fields because the flooding is rare and of brief duration.

The land capability classification is IIs. The woodland ordination symbol is 3A.

67—Wakeland silt loam. This deep, nearly level, somewhat poorly drained soil generally is on the flood plains along the St. Francois River. It is frequently flooded. Most areas are long and narrow and range from about 10 to more than 200 acres in size.

Typically, the surface layer is dark grayish brown silt loam about 5 inches thick. The substratum to a depth of 60 inches or more is brown, light brownish gray, and grayish brown silt loam. In places layers of silty clay loam are below a depth of 40 inches. In some small areas the soil is moderately well drained.

Permeability is moderate. Surface runoff is slow. The available water capacity is very high. The surface layer is friable and can be easily tilled, but it is subject to compaction and crusting if worked when wet. The content of organic matter is low, and natural fertility is high. The number of roots decreases gradually with increasing depth. The soil has few roots below a depth of about 3 feet. A water table is at a depth of 1 to 3 feet during winter and spring in most years.

Most areas are forested. Some are used for pasture and hay. Some qualify as wetlands and are suited to wetland wildlife habitat.

If drained, this soil is suited to cultivated crops and hay. It is better suited to summer-growing annuals than to small grain because the flooding usually occurs in the spring. The main management concerns are the hazards of flooding and ponding, compaction, and measures that maintain tilth and fertility. A drainage system is needed in most farmed areas. Some areas are subject to the scouring and deposition caused by runoff from the adjacent uplands or by floodwater. Diversion terraces can protect some fields against the runoff from the adjacent uplands. Trees and brush along the stream channels slow floodwater and help to stabilize the channels. Field ditches or tile can be used to drain wet spots. Plowpans or traffic pans form readily in cultivated fields. Subsoiling or chiseling and reducing the number of trips over the field help to maintain favorable rooting conditions. Conservation tillage and additions of manure, lime, and fertilizer help to keep the soil in good tilth and maintain fertility.

This soil is well suited to reed canarygrass. It is moderately well suited to the commonly grown legumes, such as red clover, ladino clover, and lespedeza; to

cool-season grasses, such as tall fescue; and to warm-season grasses, such as switchgrass. The seasonal high water table is the main problem. It should be considered when species are selected for planting. A drainage system is beneficial, especially if deep-rooted species are grown. A seedbed can be easily prepared. The main management concerns are preventing overgrazing and maintaining a good stand. Overgrazing causes compaction, deterioration of the stand, and excessive runoff. Restricted or deferred grazing during periods of flooding and during wet periods helps to prevent compaction and deterioration of the stand. Proper stocking rates, pasture rotation, deferred grazing, and applications of fertilizer help to keep the pasture in good condition.

This soil is suited to trees. Plant competition is moderate where seedlings are planted. It can be controlled by proper site preparation, prescribed burning, applications of herbicide, or cutting. Planting and harvesting can be scheduled during the summer and fall, when flooding is less likely and the soil is dry.

This soil generally is unsuitable for building site development and onsite waste disposal because of the flooding and the wetness.

The land capability classification is IIIw. The woodland ordination symbol is 5A.

80B—Bloomsdale very gravelly loam, 0 to 4 percent slopes. This deep, nearly level and gently sloping, well drained soil is on the upper reaches of narrow flood plains in the St. Francois Mountains. It is subject to frequent flash flooding. Most areas are long and narrow and range from about 20 to more than 100 acres in size.

Typically, the surface layer is brown very gravelly loam about 8 inches thick (fig. 7). The substratum is brown very gravelly sandy loam about 16 inches thick. Below this to a depth of 60 inches or more is a buried subsoil of dark brown extremely cobbly clay. In some places the surface layer is gravelly loam or very gravelly or gravelly sandy loam. In other places, the surface is covered with cobbles and stones and the slope is more than 4 percent. In some areas the soil is not so deep to clay.

Permeability is moderate. Surface runoff is slow. The available water capacity is low. The surface layer has gravel, cobbles, and some stones, all of which interfere with tillage. The surface layer is friable, but it can be easily tilled only in a few areas where the content of rock fragments is low. Natural fertility is medium, and the content of organic matter is moderately low. The number of roots decreases gradually with increasing depth. The soil has few roots below a depth of about 3 feet. The shrink-swell potential is moderate.

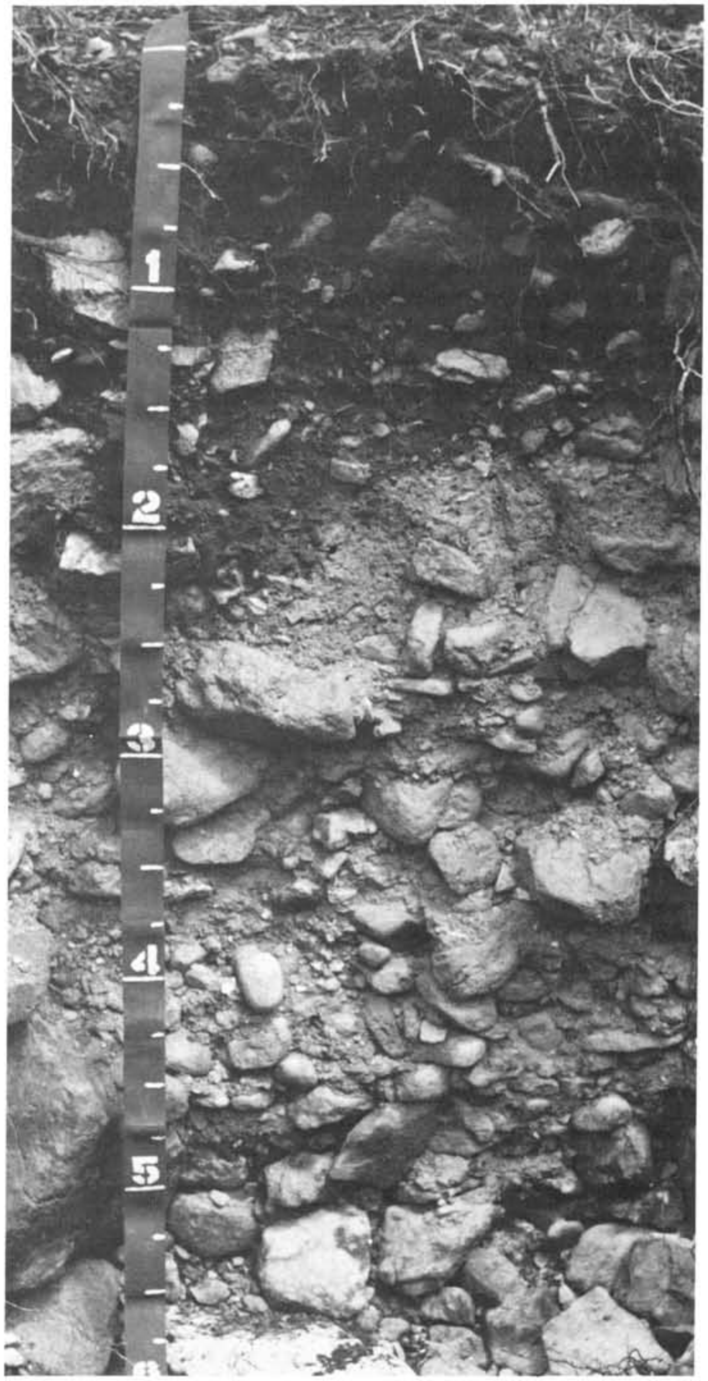

Figure 7.—Profile of Bloomsdale very gravelly loam, 0 to 4 percent slopes. The content of cobbles and stones increases with increasing depth. Depth is marked in feet.

Most areas are forested. A few small areas have

been cleared and are used for pasture. This soil generally is poorly suited to cultivated crops. It also is poorly suited to hay unless the stones are removed. It is suited to most of the commonly grown legumes, such as ladino clover and red clover; to cool-season grasses, such as tall fescue and reed canarygrass; and to warm-season grasses, such as Caucasian bluestem and switchgrass. It is best suited to drought-tolerant perennials because of the low available water capacity. Droughtiness and flooding are the main problems. Other management concerns are maintaining tilth and fertility, preventing overgrazing, and maintaining a good stand. Overgrazing causes compaction and deterioration of the stand. A pasture can be more easily established and managed in the less stony areas. Large stones can be removed. Proper stocking rates, pasture rotation, deferred grazing, and applications of fertilizer help to keep the pasture in good condition. Hand planting or direct seeding is needed.

This soil is suited to trees. The equipment limitation and seedling mortality are the major management concerns. The seedling mortality caused by drought can be minimized by planting the larger seedlings or containerized nursery stock. Because of the gravel, cobbles, and stones, hand planting or direct seeding may be needed. Properly managing the stand helps to ensure natural regeneration. Logs can be yarded to selected logging roads. Planting and harvesting can be scheduled during the summer and fall, when flooding is less likely and the soil is dry.

This soil generally is unsuitable for building site development and onsite waste disposal because of the flooding.

The land capability classification is IVw. The woodland ordination symbol is 3F.

81A—Midco cherty loam, 0 to 3 percent slopes. This deep, nearly level and gently sloping, somewhat excessively drained soil is on narrow flood plains along small streams and creeks. It is frequently flooded for very brief periods. Most areas are long and narrow and range from about 10 to more than 200 acres in size.

Typically, the surface layer is dark brown cherty loam about 7 inches thick (fig. 8). Below this to a depth of 60 inches or more are brown strata of very cherty and extremely cherty loam and extremely cherty sandy loam. In some areas the dark surface layer is more than 10 inches thick. In other areas the soil is only occasionally flooded.

Included with this soil in mapping are very small areas of excessively drained, sandy soils or gravel bars near or in the stream channels. Also included are areas

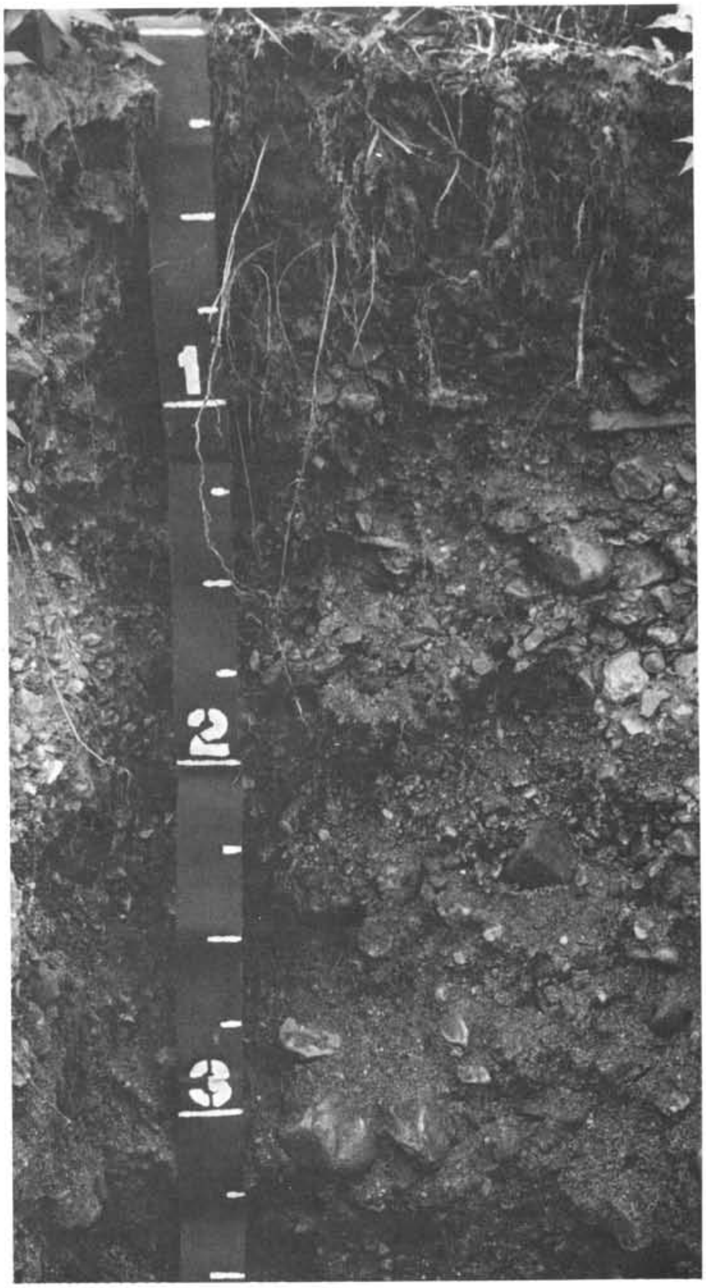

Figure 8.—Profile of Midco cherty loam, 0 to 3 percent slopes. The chert gravel in this soil washed in from the upland slopes of the Salem Plateau. Depth is marked in feet.

of the well drained Bloomsdale soils in landscape positions similar to those of the Midco soil and some areas where the surface layer is very cherty. Included areas make up about 10 percent of the unit.

Permeability is moderately rapid in the Midco soil. Surface runoff is slow. The available water capacity is

low. The surface layer is friable, but the chert interferes with tillage. Natural fertility is medium, and the content of organic matter is moderately low. The number of roots decreases gradually with increasing depth. The soil has few roots below a depth of about 3 feet.

Most areas are used for pasture and hay. Small areas along stream channels are forested.

This soil is suited to cultivated crops and hay. It is better suited to summer-growing annuals than to small grain because the flooding usually occurs in the early spring. The soil is best suited to drought-tolerant annuals and perennials because of the low available water capacity. The main management concerns are the hazards of flooding and drought, gravel or small cobbles in the plow layer, and measures that maintain tilth and fertility. Some areas are subject to the scouring and deposition caused by runoff from the adjacent uplands or by floodwater. A sod-forming perennial, such as tall fescue, can minimize the damage caused by scouring. Trees and brushy plants along the stream channels slow floodwater, help to stabilize streambanks, and reduce the amount of gravel deposited on nearby fields. Diversions can protect this soil against the runoff from the adjacent uplands. Conservation tillage and additions of manure, lime, and fertilizer help to keep the soil in good tilth and maintain fertility.

This soil is suited to most of the commonly grown legumes, such as ladino clover and red clover; to cool-season grasses, such as tall fescue and reed canarygrass; and to warm-season grasses, such as Caucasian bluestem and switchgrass. Droughtiness and flooding are the main problems. Other management concerns are preventing overgrazing and maintaining a good stand. Overgrazing causes compaction and deterioration of the stand. Planting species that can withstand flooding helps to maintain the stand. Proper stocking rates, pasture rotation, deferred grazing, and applications of fertilizer help to keep the pasture in good condition.

This soil is suited to trees. Seedling mortality and plant competition are management concerns. The seedling mortality caused by drought and plant competition can be minimized by planting the larger seedlings or containerized nursery stock. Properly managing the stand helps to ensure natural regeneration. Plant competition can be controlled by proper site preparation, prescribed burning, applications of herbicide, or cutting. Planting and harvesting can be scheduled during the summer and fall, when flooding is less likely and the soil is dry.

This soil generally is unsuitable for building site development and onsite waste disposal because of the flooding.

The land capability classification is IIIw. The woodland ordination symbol is 3F.

82A—Dameron silt loam, clayey substratum, 0 to 3 percent slopes. This deep, nearly level and gently sloping, well drained soil is on narrow flood plains along branches and creeks. It is frequently flooded for very brief periods. Most areas are long and narrow and range from about 5 to more than 200 acres in size.

Typically, the surface layer is very dark grayish brown silt loam about 23 inches thick. The subsurface layer is very dark grayish brown silty clay loam about 6 inches thick. The upper part of the substratum is dark brown very cherty silty clay loam. The next part is brown cherty clay loam. The lower part to a depth of 60 inches or more is brown very cherty clay. In places the soil has more sand throughout.

Included with this soil in mapping are areas of the somewhat excessively drained Midco soils and small areas of Secesh soils. Midco soils are in narrow areas adjacent to the stream channels. Secesh soils are lighter colored in the upper part than the Dameron soil. They are on stream terraces that are only rarely flooded. Also included are some areas where the soil is occasionally flooded. Included soils make up about 10 percent of the unit.

Permeability is moderately slow in the Dameron soil. Surface runoff is slow or medium. The available water capacity is moderate. The surface layer is very friable and can be easily tilled. The content of organic matter is moderate, and natural fertility is medium. The rooting depth is partly restricted by the cherty substratum. The shrink-swell potential is moderate.

Most areas are used for pasture and hay. Small areas along stream channels are forested.

This soil is suited to cultivated crops and hay. The main management concerns are the hazards of flooding and drought and a few large stones in the plow layer. Some areas are subject to the scouring and deposition caused by runoff from the adjacent uplands or by floodwater. The flooding is of short duration. It can occur at any time of the year but is most likely during the period December through April. A sod-forming perennial, such as tall fescue, can minimize the damage caused by scouring in areas that are likely to be covered by swiftly moving water. Trees and brushy plants along the stream channels slow floodwater, help stabilize the streambank, and reduce the amount of gravel deposited on nearby fields. Diversions can

protect this soil against the runoff from the adjacent uplands.

This soil is suited to most of the commonly grown legumes, such as ladino clover and red clover; to cool-season grasses, such as tall fescue and reed canarygrass; and to warm-season grasses, such as Caucasian bluestem and switchgrass. Droughtiness and flooding are the main problems. Other management concerns are preventing overgrazing and maintaining a good stand. Overgrazing causes compaction and deterioration of the stand. Restricted or deferred grazing during periods of flooding and during wet periods helps to prevent compaction and deterioration of the stand. Proper stocking rates, pasture rotation, deferred grazing, and applications of fertilizer help to keep the pasture in good condition.

This soil is suited to trees. Plant competition is moderate where seedlings are planted. Planting seedlings of a larger size than is typical or planting containerized nursery stock can increase the survival rate. Plant competition can be controlled by proper site preparation, prescribed burning, applications of herbicide, or cutting. Planting and harvesting can be scheduled during the summer and fall, when flooding is less likely and the soil is dry.

This soil generally is unsuitable for building site development and onsite waste disposal because of the flooding.

The land capability classification is IIw. The woodland ordination symbol is 5A.

91—Udipsamments, sloping. These deep, nearly level and undulating, excessively drained, newly formed soils are on low slopes and in tailings ponds. Many areas of the tailings are frequently or occasionally flooded. The soils formed in dolomitic material that was crushed during lead-mining activities. Most of the acreage is in a few irregularly shaped areas ranging from about 10 to more than 100 acres in size.

Typically, the surface layer is brown loamy fine sand about 1 inch thick. Below this to a depth of 60 inches or more is grayish brown loamy fine sand that is faintly stratified. The soils are mildly alkaline throughout.

Included with these soils in mapping is an area near Pilot Knob where igneous rocks were crushed during iron-mining activities. The soils in this area are darker than the Udipsamments and are acid unless they have been limed. Also included are some areas that are not subject to flooding and areas of open water and waterlogged soil. Included areas make up about 10 percent of the unit.

Permeability is rapid in the Udipsamments. Surface runoff is slow or medium. Most of the precipitation received by the soils penetrates the surface. The available water capacity is low. Natural fertility also is low, and the content of organic matter is very low. A water table fluctuates between depths of 2 and 6 feet.

Some areas have essentially been abandoned. Some have been fertilized and seeded to grasses and legumes. Other areas support natural revegetation of brushy trees, forbs, and grasses. Establishing a vegetative cover helps to protect the drier sites from soil blowing. The species selected for planting should be those that can tolerate a high content of lime and alkalinity. Applications of fertilizer are needed. In the area near Pilot Knob, applications of lime are needed.

The wildlife habitat in areas of these soils is limited, but it can be improved by establishing vegetation. Migrating waterfowl use the water areas. Shore birds and water-loving mammals are attracted to these areas. The drier sites are inhabited by essentially no wildlife. The soils can produce a better quality of cover and food and thus can support more wildlife. Some of the water areas provide limited opportunities for fishing.

These soils generally are not suited to most recreation uses because of the flooding. The sandy texture and soil blowing are limitations in areas that are not subject to flooding.

These soils are not suitable for building site development or onsite waste disposal because of the flooding. Areas that are not subject to flooding are suitable for building site development. Because of the rapid permeability, however, the effluent from sanitary facilities can contaminate ground water. Detailed onsite investigation is needed in areas being considered for development.

No land capability classification or woodland ordination symbol is assigned.

94—Pits and dumps. This map unit is in an area near Annapolis. It consists of an excavated rhyolite quarry and the adjacent pile of unused crushed rock. It is about 55 percent Pits and 45 percent dumps. The Pits make up about 100 acres and the dumps about 95 acres.

Pits are the open excavations from which soil and rocks have been removed. They commonly do not support plants because of the lack of soil material. The depth of pits ranges to nearly 100 feet. Some areas may hold water unless drained by pumps or other means. The pit bottom consists of bare rock and only sparse, thin unconsolidated material.

Dumps consist of the refuse and unused crushed rock piled in areas near the excavations. Most do not

support vegetation. The material is mostly dark, sandy rhyolite, a crushed by-product of the manufacture of roof shingles. It is loose rock and shows no evidence of weathering or other soil-forming processes.

Permeability is very rapid in the dumps. Most of the precipitation received in these areas penetrates the surface. The available water capacity is very low. The material is very acid and has insufficient plant nutrients to support most plants. It is a source of sand. It may have potential for use in buildings, roads, or concrete. When leveled, it is stable and suitable for building site development.

No land capability classification or woodland ordination symbol is assigned.

Prime Farmland

Prime farmland is one of several kinds of important farmland defined by the U.S. Department of Agriculture. It is of major importance in meeting the Nation's short- and long-range needs for food and fiber. Because the supply of high-quality farmland is limited, the U.S. Department of Agriculture recognizes that responsible levels of government, as well as individuals, should encourage and facilitate the wise use of our Nation's prime farmland.

Prime farmland, as defined by the U.S. Department of Agriculture, is the land that is best suited to food, feed, forage, fiber, and oilseed crops. It may be cultivated land, pasture, woodland, or other land, but it is not urban and built-up land or water areas. It either is used for food or fiber crops or is available for those crops. The soil qualities, growing season, and moisture supply are those needed for a well managed soil to produce a sustained high yield of crops in an economic manner. Prime farmland produces the highest yields with minimal expenditure of energy and economic resources, and farming it results in the least damage to the environment.

Prime farmland has an adequate and dependable supply of moisture from precipitation or irrigation. The temperature and growing season are favorable. The level of acidity or alkalinity is acceptable. Prime farmland has few or no rocks and is permeable to water and air. It is not excessively erodible or saturated with water for long periods and is not frequently flooded during the growing season. The slope ranges mainly from 0 to 6 percent. More detailed information about the criteria for prime farmland is available at the local office of the Soil Conservation Service or the Missouri University Extension Service.

About 11,200 acres in Iron County, or 3.2 percent of the total acreage, meets the soil requirements for prime farmland. An additional 7,486 acres, or 2.1 percent, meets the requirements where the soils are drained or protected from flooding. Scattered areas of this land are throughout the county, but most are in the Arcadia Valley and Belleview Valley, mainly in the Courtois-Fourche-Gatewood association, which is described under the heading "General Soil Map Units." Most of this land is used for pasture and hay. The acreage in the county used for row crops or small grain is small. Nearly all of this acreage is prime farmland.

Some prime farmland has been lost to industrial and urban uses. The loss of prime farmland to other uses puts pressure on marginal lands, which generally are more erodible, droughty, and less productive and cannot be easily cultivated.

The map units in the survey area that are considered prime farmland are listed in table 5. This list does not constitute a recommendation for a particular land use. The extent of each listed map unit is shown in table 4. The location is shown on the detailed soil maps at the back of this publication. The soil qualities that affect use and management are described under the heading "Detailed Soil Map Units."

Some soils that have a seasonal high water table and all soils that are frequently flooded during the growing season qualify for prime farmland only in areas where these limitations have been overcome by drainage measures or flood control. The need for these measures is indicated after the map unit name in table 5. Onsite evaluation is needed to determine whether or not these limitations have been overcome by corrective measures.

Use and Management of the Soils

This soil survey is an inventory and evaluation of the soils in the survey area. It can be used to adjust land uses to the limitations and potentials of natural resources and the environment. Also, it can help avoid soil-related failures in land uses.

In preparing a soil survey, soil scientists, conservationists, engineers, and others collect extensive field data about the nature and behavior characteristics of the soils. They collect data on erosion, droughtiness, flooding, and other factors that affect various soil uses and management. Field experience and collected data on soil properties and performance are used as a basis in predicting soil behavior.

Information in this section can be used to plan the use and management of soils for crops and pasture; as woodland; as sites for buildings, sanitary facilities, highways and other transportation systems, and parks and other recreation facilities; and for wildlife habitat. It can be used to identify the potentials and limitations of each soil for specific land uses and to help to prevent construction failures caused by unfavorable soil properties.

Planners and others using soil survey information can evaluate the effect of specific land uses on productivity and on the environment in all or part of the survey area. The survey can help planners to maintain or create a land use pattern in harmony with the natural soil.

Contractors can use this survey to locate sources of sand and gravel, roadfill, and topsoil. They can use it to identify areas where bedrock, wetness, or very firm soil layers can cause difficulty in excavation.

Health officials, highway officials, engineers, and others may also find this survey useful. The survey can help them plan the safe disposal of wastes and locate sites for pavements, sidewalks, campgrounds, playgrounds, lawns, and trees and shrubs.

Crops and Pasture

General management needed for crops and pasture is suggested in this section. The crops or pasture plants best suited to the soils, including some not commonly grown in the survey area, are identified; the system of land capability classification used by the Soil Conservation Service is explained; and the estimated yields of the main crops and hay and pasture plants are listed for each soil.

Planners of management systems for individual fields or farms should consider the detailed information given in the description of each soil under "Detailed Soil Map Units." Specific information can be obtained from the local office of the Soil Conservation Service or the Cooperative Extension Service.

Approximately one-fifth of the acreage in Iron County is suitable for crops and pasture. Most of this acreage is used for pasture and hay. Corn, wheat, soybeans, and grain sorghum are grown with some regularity on about 4,000 acres. Hay is harvested on nearly 12,000 acres. Such crops as barley, oats, white corn, Irish potatoes, strawberries, apples, and peaches can be grown in the county. Other crops that can be grown are sunflowers; blueberries, grapes, and other fruits; vegetables; nuts; and nursery plants. Many of the soils are suited to Christmas trees.

The potential of the soils for increased food production is good. Nearly 30,000 acres of cropland is in nearly level or gently sloping areas. An additional 75,000 acres of sloping soils can be used for crops where adequately protected against erosion. Food production also can be increased by extending the latest crop production technology to all cropland in the county. This survey can greatly facilitate the use of such technology.

Management of Cropland

The main management needs on the cropland in the county are measures that help to control erosion, improve or maintain fertility and tilth, and minimize the effects of flooding.

Erosion is the major hazard on most of the upland soils in the county. Most of the upland soils used as cropland have a silt loam surface layer, which is easily

eroded by moving water. This erodible layer, in combination with a slope of more than than about 3 percent or a slowly permeable layer, such as a fragipan, can result in excessive erosion if the soil is cultivated year after year.

Loss of the surface layer reduces the level of fertility and available water capacity of the soil and results in deterioration of tilth. It is especially damaging on soils that have a fragipan and on soils that are moderately deep over bedrock. It is less damaging on Crider, Fourche, and other soils in which the rooting depth is not significantly restricted. An increased use of fertilizer helps to offset the losses caused by erosion, but much of the loss is irretrievable. Control of erosion preserves the soil. It also minimizes the stream pollution caused by sedimentation and thus improves water quality.

Measures that reduce the hazard of erosion provide a protective cover of plants or crop residue or control the water flowing over the field. Properly managed permanent pasture or hayland can provide 95 percent or more of the protection needed to control erosion. Crop rotations in which cultivated crops are alternated with meadow crops help to control erosion.

A system of conservation tillage that does not invert the soil and leaves a protective amount of crop residue on the surface throughout the year also can help to control erosion. For example, shredding corn stalks and chisel plowing in the fall and then preparing a seedbed in the spring and leaving about 20 percent of the surface covered by crop residue after planting can reduce sheet erosion by one-half or more compared to the erosion resulting from fall plowing with a moldboard plow. No-tillage systems, which leave nearly all of the crop residue on the surface, are even more effective in controlling erosion. Because the soil dries more slowly under a cover of residue, these systems can slightly delay planting in the spring. As a result, applying a no-tillage system may be more difficult on the wetter soils in the county, such as Auxvasse, Loughboro, and Wakeland soils.

Contour farming and contour stripcropping can help to control erosion on fields that have smooth, uniform slopes. Terraces, which catch surface runoff and divert it to safe outlets, can be effective in some fields. Parallel terraces are much easier to farm than contour terrace systems. Terraces are more effective on deep soils in which the rooting depth is not significantly restricted, such as Courtois, Crider, Fourche, and Lowell soils, than on other soils.

Soil fertility is medium or high in the soils on bottom land along creeks and rivers and medium or low in most of the soils on uplands. Most of the upland soils are naturally acid. Applications of lime are needed to raise the pH level before most crops can grow well on these soils. On all soils, the amount of fertilizer and lime needed should be based on the results of soil tests, the needs of the crops, and the expected level of yields. The Cooperative Extension Service can help to determine the kind and amount of fertilizer and lime needed.

Soil tilth is an important factor affecting the germination of seeds and the infiltration of water into the soil. Soils that have good tilth are granular and porous. In Iron County, most of the soils used for cultivated crops have a silt loam surface layer that is low or moderately low in organic matter content. Generally, the soil structure becomes weaker when these soils are tilled. This deterioration of structure can increase the susceptibility to compaction and surface crusting. Tillage when the soils are wet can further increase the susceptibility to compaction, even below the plow layer. Subsoiling and varying the depth of plowing minimize compaction and help to prevent the formation of traffic pans. Regular additions of crop residue, manure, and other organic material improve tilth and minimize surface crusting.

Flooding is a major concern on the soils along streams in the county. Soils that commonly are along the upper reaches of the streams, such as Midco and Bloomsdale soils, are subject to frequent flash flooding. Soils on stream terraces, such as Auxvasse and Secesh soils, are rarely, if ever, flooded. Soil drainage is a minor problem. In some cropped areas of Auxvasse, Loughboro, and Wakeland soils, additional surface drainage measures are needed. Wet spots or seeps are common on foot slopes in areas of such soils as Fourche and Viraton. Underground tile lines can be used to improve drainage or, in some areas, to develop a water supply for livestock.

Management of Pasture

Tall fescue and orchardgrass are the most common pasture grasses grown in the county. Most of the growth of these cool-season grasses occurs in the spring and fall. Other cool-season grasses include bluegrass, smooth brome, redtop, and timothy. Most of the growth of warm-season grasses occurs during the summer. These grasses can provide better quality forage during this time of the year. The warm-season grasses that can be grown include bluestems, switchgrass, and indiangrass (fig. 9). Red clover and alfalfa are the most common legumes grown for hay and pasture. They are grown in pure stands or are mixed with grasses. Lespedeza and white clover

Figure 9.—Indiangrass on Secesh silt loam, 1 to 4 percent slopes. Warm-season grasses grow as native plants on this soil and on other soils in the county.

commonly are grown in mixed stands. Sweet clover is extensively grown as a soil-improving crop. Some stands are used for hay and pasture.

Well managed stands of forage species are effective in controlling erosion. The major management concerns are overgrazing and the need for lime and fertilizer. The amount of lime and fertilizer to be applied should be based on the results of soil tests, the needs of the plants, and the expected level of production. The Cooperative Extension Service can help to determine the kind and amount of lime and fertilizer needed.

Overgrazing reduces the vigor of the pasture plants and forage production. It also allows weedy and brushy species to increase in extent. The most common weedy species are broomsedge bluestem, poverty oatgrass, wooly plantain, and ironweed. Overgrazing can be prevented by measures that maintain fertility, deferred grazing, rotation grazing, and a reduction in the number

of animals on the pasture. Deferred grazing allows the forage species a rest period, when they can build up carbohydrate reserves. Rotating the grazing among several pastures gives each pasture a rest period. The information in table 6 can be helpful in estimating the number of animals that can be maintained in a pasture.

Some soils in the county have a high water table or are seepy in spots during the spring. Grazing when the surface layer of these soils is wet should be avoided if possible. Deferred grazing during wet periods helps to prevent excessive compaction. Pasture renovation can be used where compaction continues to be a problem. Frost heaving in areas of alfalfa and red clover is a more serious problem on these soils than on other soils in the county. A stubble height of 4 to 6 inches during the winter minimizes frost heaving. Growing mixtures of grasses and legumes also minimizes frost heaving.

Yields Per Acre

The average yields per acre that can be expected of the principal crops under a high level of management are shown in table 6. In any given year, yields may be higher or lower than those indicated in the table because of variations in rainfall and other climatic factors. The land capability classification of each map unit also is shown in the table.

The yields are based mainly on the experience and records of farmers, conservationists, and extension agents. Available yield data from nearby counties and results of field trials and demonstrations also are considered.

The management needed to obtain the indicated yields of the various crops depends on the kind of soil and the crop. Management can include drainage, erosion control, and protection from flooding; the proper planting and seeding rates; suitable high-yielding crop varieties; appropriate and timely tillage; control of weeds, plant diseases, and harmful insects; favorable soil reaction and optimum levels of nitrogen, phosphorus, potassium, and trace elements for each crop; effective use of crop residue, barnyard manure, and green manure crops; and harvesting that ensures the smallest possible loss.

The estimated yields reflect the productive capacity of each soil for each of the principal crops. Yields are likely to increase as new production technology is developed. The productivity of a given soil compared with that of other soils, however, is not likely to change.

Crops other than those shown in table 6 are grown in the survey area, but estimated yields are not listed because the acreage of such crops is small. The local office of the Soil Conservation Service or of the Cooperative Extension Service can provide information about the management and productivity of the soils for those crops.

Land Capability Classification

Land capability classification shows, in a general way, the suitability of soils for most kinds of field crops. Crops that require special management are excluded. The soils are grouped according to their limitations for field crops, the risk of damage if they are used for crops, and the way they respond to management. The criteria used in grouping the soils do not include major and generally expensive landforming that would change slope, depth, or other characteristics of the soils, nor do they include possible but unlikely major reclamation projects. Capability classification is not a substitute for interpretations designed to show suitability and limitations of groups of soils for woodland and for engineering purposes.

In the capability system, soils are generally grouped at three levels: capability class, subclass, and unit *(27)*. Only class and subclass are used in this survey.

Capability classes, the broadest groups, are designated by Roman numerals I through VIII. The numerals indicate progressively greater limitations and narrower choices for practical use. The classes are defined as follows:

Class I soils have few limitations that restrict their use.

Class II soils have moderate limitations that reduce the choice of plants or that require moderate conservation practices.

Class III soils have severe limitations that reduce the choice of plants or that require special conservation practices, or both.

Class IV soils have very severe limitations that reduce the choice of plants or that require very careful management, or both.

Class V soils are not likely to erode but have other limitations, impractical to remove, that limit their use.

Class VI soils have severe limitations that make them generally unsuitable for cultivation.

Class VII soils have very severe limitations that make them unsuitable for cultivation.

Class VIII soils and miscellaneous areas have limitations or hazards that nearly preclude their use for commercial crop production.

There are no class I, V, or VIII soils in Iron County.

Capability subclasses are soil groups within one class. They are designated by adding a small letter, *e,*

w, or *s,* to the class numeral, for example, IIe. The letter *e* shows that the main hazard is the risk of water erosion unless close-growing plant cover is maintained; *w* shows that water in or on the soil interferes with plant growth or cultivation (in some soils the wetness can be partly corrected by artificial drainage); and *s* shows that the soil is limited mainly because it is shallow, droughty, or stony.

The capability classification of each map unit is given in the section "Detailed Soil Map Units" and in the yields table.

Woodland Management and Productivity

James L. Robinson, forester, Soil Conservation Service, helped prepare this section.

Approximately 76 percent of the nonfederal land in Iron County is forested *(29).* This forested land base is not expected to change much since most of the soils in the county are steep and have a high content of chert or are stony or bouldery.

Knowledge of soils helps to provide a basic understanding of the growth and development of a forest. Some of the relationships between tree species and kinds of soil have been recognized for a long time. For example, white oak grows well on deep, moist soils; post oak, blackjack oak, and eastern redcedar grow more extensively where the moisture supply is limited and the rooting depth restricted. The soil serves as a reservoir for moisture, provides an anchor for roots, and supplies most of the available plant nutrients. The soil properties that directly or indirectly affect these growth requirements include reaction, fertility, drainage, texture, structure, and depth.

Aspect and position on the landscape affect tree growth in the county. These site characteristics influence such factors as the amount of available sunlight, soil aeration, soil temperature, and moisture relations. Because of these effects, north- and east-facing slopes are the best sites for trees in the county *(16).* Some soils, such as Killarney soils, are in concave areas on the lower slopes or on foot slopes. Because they tend to accumulate moisture from the higher adjacent areas, these landscape positions are more productive than the mid and upper side slopes and the convex slopes *(14).*

The ability of a soil to supply moisture for tree growth is influenced primarily by texture, rooting depth, and content of stones and chert. Deep, loamy soils, such as Crider soils, have a high available water capacity. The content of coarse fragments affects the amount of available water in Clarksville and other soils. Other features that affect the available water capacity are a fragipan and a limited depth to bedrock, both of which restrict the rooting depth. Taumsauk and other shallow soils that have a high content of coarse fragments have very low potential productivity and generally are not suitable for commercial timber crops.

The supply of plant nutrients affects tree growth. Most of the soils on uplands in the county have a subsoil that is leached and has only a few nutrients. The inherent fertility of these soils is low or very low. Also, many deep soils in the county have low potential productivity because of droughtiness and the content of rock fragments *(31).*

Fire, excessive trampling by livestock, and erosion can destroy the leaf litter and result in the loss of many nutrients. Forest management includes the prevention of wildfires and protection from overgrazing. Management techniques also can minimize plant competition and thus increase the productive capacity of the most desirable trees.

White oak-red oak-hickory, post oak-black oak, and oak-pine are the major forest cover types on the Goss-Viburnum, Clarksville-Wilderness, Delassus-Syenite, and Courtois-Fourche-Gatewood associations (fig. 10), which are described under the heading "General Soil Map Units." Northern red oak, white oak, black oak, and hickories are dominant on the better sites. Post oak, black oak, scarlet oak, and hickories are dominant on the drier sites. Shortleaf pine grows in some areas throughout these associations. It is the dominant species in some stands, generally those on south-facing slopes or ridgetops. Except for the Courtois-Fourche-Gatewood association, these associations are used dominantly for forest. The soils in all of these associations are suitable for commercial trees.

The better sites for commercial timber in the Irondale-Killarney-Knobtop association are in areas of the Killarney soils. Stands of white oak, red oak, and hickories are dominant on the north-facing slopes, whereas post oak, black oak, scarlet oak, hickories, and shortleaf pine are dominant on the south-facing slopes (fig. 11). Eastern redcedar and low-quality hardwoods are grown in many areas of the Taumsauk-Irondale-Rock outcrop complex. These areas commonly are classified as noncommercial forests.

Table 7 can be used by woodland owners or forest managers in planning the use of soils for wood crops. Only those soils suitable for wood crops are listed. The table lists the ordination symbol for each suitable soil. Soils assigned the same ordination symbol require the same general management and have about the same potential productivity.

Figure 10.—A stand of mixed hardwoods, mainly northern red oak and white oak, in an area of Goss very cherty silt loam, 14 to 35 percent slopes, on a northeast-facing slope.

The first part of the *ordination symbol*, a number, indicates the potential productivity of the soils for an indicator tree species. The number indicates the volume, in cubic meters per hectare per year, which the indicator species can produce. The number 1 indicates low potential productivity; 2 and 3, moderate; 4 and 5, moderately high; 6 to 8, high; 9 to 11, very high; and 12 to 39, extremely high. The second part of the symbol, a letter, indicates the major kind of soil limitation. The letter *R* indicates steep slopes; *X*, stoniness or rockiness; *W*, excess water in or on the soil; *T*, toxic substances in the soil; *D*, restricted rooting depth; *C*, clay in the upper part of the soil; *S*, sandy texture; *F*, a high content of rock fragments in the soil; and *L*, low strength. The letter *A* indicates that limitations or restrictions are insignificant. If a soil has more than one limitation, the priority is as follows: R, X, W, T, D, C, S, F, and L.

In table 7, *slight, moderate,* and *severe* indicate the degree of the major soil limitations to be considered in management.

Erosion hazard is the probability that damage will occur as a result of site preparation and cutting where the soil is exposed along roads, skid trails, fire lanes, and log-handling areas. Forests that have been burned or overgrazed also are subject to erosion. Ratings of the erosion hazard are based on the percent of the slope. A rating of *slight* indicates that no particular prevention measures are needed under ordinary conditions. A rating of *moderate* indicates that erosion-control measures are needed in certain silvicultural activities. A rating of *severe* indicates that special precautions are needed to control erosion in most silvicultural activities.

Equipment limitation reflects the characteristics and conditions of the soil that restrict use of the equipment generally needed in woodland management or harvesting. The chief characteristics and conditions considered in the ratings are slope, stones on the surface, rock outcrops, soil wetness, and texture of the surface layer. A rating of *slight* indicates that under normal conditions the kind of equipment or season of use is not significantly restricted by soil factors. Soil wetness can restrict equipment use, but the wet period does not exceed 1 month. A rating of *moderate* indicates that equipment use is moderately restricted because of one or more soil factors. If the soil is wet, the wetness restricts equipment use for a period of 1 to 3 months. A rating of *severe* indicates that equipment use is severely restricted either as to the kind of equipment that can be used or the season of use. If the soil is wet, the wetness restricts equipment use for more than 3 months.

Seedling mortality refers to the death of naturally occurring or planted tree seedlings, as influenced by the kinds of soil, soil wetness, or topographic conditions. The factors used in rating the soils for seedling mortality are texture of the surface layer, depth to a seasonal high water table and the length of the period when the water table is high, rock fragments in the surface layer, effective rooting depth, and slope aspect. A rating of *slight* indicates that seedling mortality is not likely to be a problem under normal conditions. Expected mortality is less than 25 percent. A rating of *moderate* indicates

that some problems from seedling mortality can be expected. Extra precautions are advisable. Expected mortality is 25 to 50 percent. A rating of *severe* indicates that seedling mortality is a serious problem. Extra precautions are important. Replanting may be necessary. Expected mortality is more than 50 percent.

Windthrow hazard is the likelihood that trees will be uprooted by the wind because the soil is not deep enough for adequate root anchorage. The main restrictions that affect rooting are a seasonal high water table and the depth to bedrock, a fragipan, or other limiting layers (fig. 12). A rating of *slight* indicates that under normal conditions no trees are blown down by the wind. Strong winds may damage trees, but they do not uproot them. A rating of *moderate* indicates that some trees can be blown down during periods when the soil is wet and winds are moderate or strong. A rating of *severe* indicates that many trees can be blown down during these periods.

The *potential productivity* of merchantable or *common trees* on a soil is expressed as a *site index* and as a *volume* number. The site index is the average height, in feet, that dominant and codominant trees of a given species attain in a specified number of years. The site index applies to fully stocked, even-aged, unmanaged stands. Commonly grown trees are those that woodland managers generally favor in intermediate or improvement cuttings. They are selected on the basis of growth rate, quality, value, and marketability.

The *volume*, a number, is the yield likely to be produced by the most important trees. This number, expressed as cubic feet per acre per year, indicates the amount of fiber produced in a fully stocked, even-aged, unmanaged stand.

The first species listed under *common trees* for a soil is the indicator species for that soil. It is the dominant species on the soil and the one that determines the ordination class.

Trees to plant are those that are suitable for commercial wood production.

Windbreaks and Environmental Plantings

Windbreaks protect livestock, buildings, and yards from wind and snow. They also protect fruit trees and gardens, and they furnish habitat for wildlife. Several rows of low- and high-growing broadleaf and coniferous trees and shrubs provide the most protection.

Field windbreaks are narrow plantings made at right angles to the prevailing wind and at specific intervals across the field. The interval depends on the erodibility of the soil. Field windbreaks protect cropland and crops from wind, help to keep snow on the fields, and provide food and cover for wildlife.

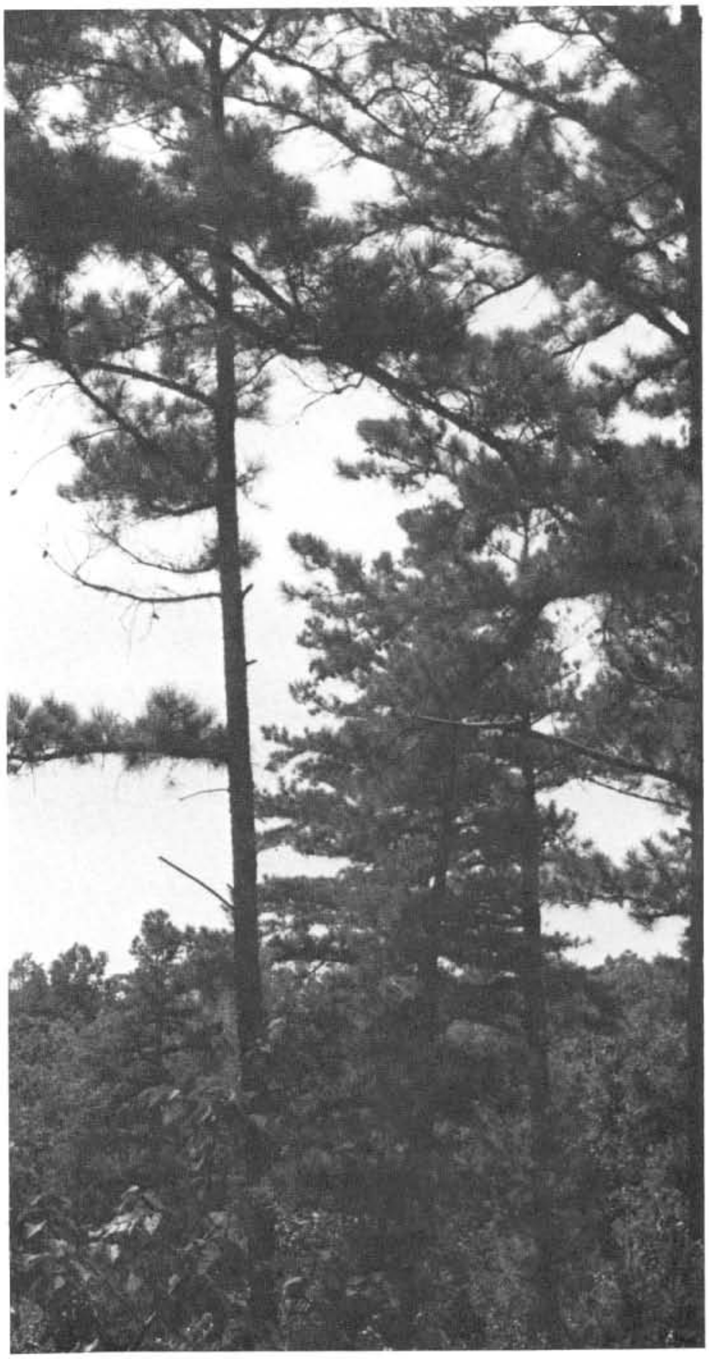

Figure 11.—Shortleaf pine in an area of Killarney very cobbly silt loam, 14 to 50 percent slopes, rubbly, on a south-facing slope.

Environmental plantings help to beautify and screen houses and other buildings and to abate noise. The

Figure 12.—Windthrow in an area of Wilderness very cherty silt loam, 5 to 14 percent slopes. This soil has a fragipan.

plants, mostly evergreen shrubs and trees, are closely spaced. To ensure plant survival, a healthy planting stock of suitable species should be planted properly on a well prepared site and maintained in good condition.

Table 8 shows the height that locally grown trees and shrubs are predicted to reach in 20 years on various soils. The estimates in table 8 are based on measurements and observation of established plantings that have been given adequate care. They can be used as a guide in planning windbreaks and screens. Additional information on planning windbreaks and screens and planting and caring for trees and shrubs can be obtained from local offices of the Soil Conservation Service or the Cooperative Extension Service or from a commercial nursery.

Recreation

Pat Graham, biologist, Soil Conservation Service, helped prepare this section.

Much of the natural beauty of Iron County has remained unchanged since the pioneer days. Although logging and mining are major industries, the county has a low population density and few large towns. It has clear, free-flowing streams (fig. 13). It is in one of the best areas in Missouri for outdoor recreational activities, including camping, hiking, sightseeing, and canoeing.

The expansive forests and the geological features are key elements in the beauty of the county. The vast forest includes some of the most remote areas in Missouri. Granite boulders called elephant rocks are exposed near Graniteville. These are small exposures of a huge batholith that underlies the survey area. Taum Sauk Mountain, which reaches an elevation of 1,772 feet, is the highest point in Missouri and in the entire Ozark Mountain Range.

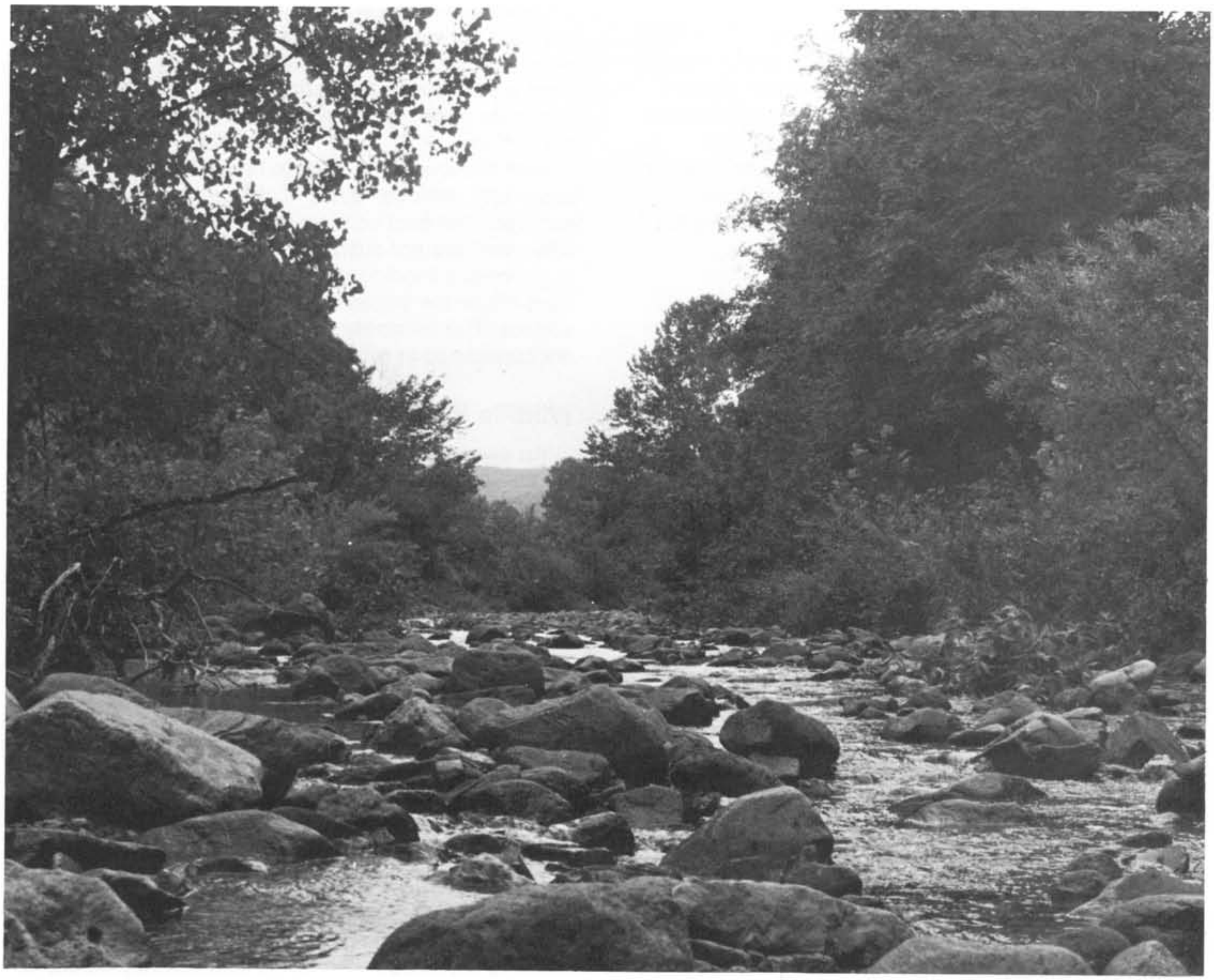

Figure 13.—One of many clear mountain streams in Iron County. These streams are lined with cobbles, stones, and rhyolite and granite boulders.

A large part of Iron County is made up of public land in the Mark Twain National Forest. This land is open to the public for recreational activities, such as hiking, camping, and hunting. Turkey and deer hunters enjoy average success rates in the county.

The soils of the survey area are rated in table 9 according to limitations that affect their suitability for recreation. The ratings are based on restrictive soil features, such as wetness, slope, and large stones on the surface. Susceptibility to flooding is considered. Not considered in the ratings, but important in evaluating a site, are the location and accessibility of the area, the size and shape of the area and its scenic quality, vegetation, access to water, potential water impoundment sites, and access to public sewer lines. The capacity of the soil to absorb septic tank effluent and the ability of the soil to support vegetation are also important. Soils subject to flooding are limited for recreation use by the duration and intensity of flooding and the season when flooding occurs. In planning recreation facilities, onsite assessment of the height, duration, intensity, and frequency of flooding is essential.

In table 9, the degree of soil limitation is expressed as slight, moderate, or severe. *Slight* means that soil properties are generally favorable and that limitations are minor and easily overcome. *Moderate* means that limitations can be overcome or alleviated by planning, design, or special maintenance. *Severe* means that soil properties are unfavorable and that limitations can be offset only by costly soil reclamation, special design, intensive maintenance, limited use, or by a combination of these measures.

The information in table 9 can be supplemented by other information in this survey, for example, interpretations for septic tank absorption fields in table 12 and interpretations for dwellings without basements and for local roads and streets in table 11.

Camp areas require site preparation, such as shaping and leveling the tent and parking areas, stabilizing roads and intensively used areas, and installing sanitary facilities and utility lines. Camp areas are subject to heavy foot traffic and some vehicular traffic. The best soils are gently sloping and are not wet or subject to flooding during the period of use. The surface has few or no stones or boulders, absorbs rainfall readily but remains firm, and is not dusty when dry. Strong slopes and stones or boulders can greatly increase the cost of constructing campsites.

Picnic areas are subject to heavy foot traffic. Most vehicular traffic is confined to access roads and parking areas. The best soils for picnic areas are firm when wet, are not dusty when dry, are not subject to flooding during the period of use, and do not have slopes or stones or boulders that increase the cost of shaping sites or of building access roads and parking areas.

Playgrounds require soils that can withstand intensive foot traffic. The best soils are almost level and are not wet or subject to flooding during the season of use. The surface is free of stones and boulders, is firm after rains, and is not dusty when dry. If grading is needed, the depth of the soil over bedrock or a hardpan should be considered.

Paths and trails for hiking and horseback riding should require little or no cutting and filling. The best soils are not wet, are firm after rains, are not dusty when dry, and are not subject to flooding more than once a year during the period of use. They have moderate slopes and few or no stones or boulders on the surface.

Golf fairways are subject to heavy foot traffic and some light vehicular traffic. Cutting or filling may be required. The best soils for use as golf fairways are firm when wet, are not dusty when dry, and are not subject to prolonged flooding during the period of use. They have moderate slopes and no stones or boulders on the surface. The suitability of the soil for tees or greens is not considered in rating the soils.

Wildlife Habitat

Pat Graham, biologist, Soil Conservation Service, helped prepare this section.

Iron County is in the part of the state known as the Ozark Plateau. It has three broad regions, each of which provides a distinct kind of wildlife habitat. The first of these is in mountainous areas, where soil productivity is low and where most of the streams in the county arise. Some of these areas are only sparsely wooded. The second region is the dissected Salem Plateau, which is dominantly wooded with the oak-hickory association interspersed with shortleaf pine. The third region occurs as valleys and river bottoms, most of which have been cleared. These areas include the best farmland in the county.

The county is about 80 percent forest land and areas of woody vegetation, 15 percent grassland, and less than 5 percent cropland. The plant species on the grassland have changed from mixed prairie grasses and forbs to cool-season grasses, the most common of which is tall fescue. The forest land typically occurs as stands of pole-sized oak and hickory. The stands have a closed canopy and generally do not have a diverse, well developed understory. Most have been repeatedly

cut and burned over. The great expanses of unbroken woodland are important to the wildlife species that inhabit the interior of a forest, but there is a scarcity of suitable edge areas, where cover types are interspersed.

Over 180 species of fish and wildlife inhabit Iron County. About 75 percent of these are nongame species, including downy woodpecker, tufted titmouse, ovenbird, wood frog, and common nighthawk. The most common game species are white-tailed deer, wild turkey, gray squirrel, raccoon, red fox, and gray fox.

Soils affect the kind and amount of vegetation that is available to wildlife as food and cover. They also affect the construction of water impoundments. The kind and abundance of wildlife depend largely on the amount and distribution of food, cover, and water. Wildlife habitat can be created or improved by planting appropriate vegetation, by maintaining the existing plant cover, or by promoting the natural establishment of desirable plants.

In table 10, the soils in the survey area are rated according to their potential for providing habitat for various kinds of wildlife. This information can be used in planning parks, wildlife refuges, nature study areas, and other developments for wildlife; in selecting soils that are suitable for establishing, improving, or maintaining specific elements of wildlife habitat; and in determining the intensity of management needed for each element of the habitat.

The potential of the soil is rated good, fair, poor, or very poor. A rating of *good* indicates that the element or kind of habitat is easily established, improved, or maintained. Few or no limitations affect management, and satisfactory results can be expected. A rating of *fair* indicates that the element or kind of habitat can be established, improved, or maintained in most places. Moderately intensive management is required for satisfactory results. A rating of *poor* indicates that limitations are severe for the designated element or kind of habitat. Habitat can be created, improved, or maintained in most places, but management is difficult and must be intensive. A rating of *very poor* indicates that restrictions for the element or kind of habitat are very severe and that unsatisfactory results can be expected. Creating, improving, or maintaining habitat is impractical or impossible.

The elements of wildlife habitat are described in the following paragraphs.

Grain and seed crops are domestic grains and seed-producing herbaceous plants. Soil properties and features that affect the growth of grain and seed crops are depth of the root zone, texture of the surface layer, available water capacity, wetness, slope, surface stoniness, and flood hazard. Soil temperature and soil moisture are also considerations. Examples of grain and seed crops are corn, wheat, oats, and soybeans.

Grasses and legumes are domestic perennial grasses and herbaceous legumes. Soil properties and features that affect the growth of grasses and legumes are depth of the root zone, texture of the surface layer, available water capacity, wetness, surface stoniness, flood hazard, and slope. Soil temperature and soil moisture are also considerations. Examples of grasses and legumes are bluegrass, switchgrass, orchardgrass, clover, alfalfa, and lespedeza.

Wild herbaceous plants are native or naturally established grasses and forbs, including weeds. Soil properties and features that affect the growth of these plants are depth of the root zone, texture of the surface layer, available water capacity, wetness, surface stoniness, and flood hazard. Soil temperature and soil moisture are also considerations. Examples of wild herbaceous plants are bluestem, goldenrod, beggarweed, pokeweed, foxtail, croton, and partridge pea.

Hardwood trees and woody understory produce nuts or other fruits, buds, catkins, twigs, bark, and foliage. Soil properties and features that affect the growth of hardwoods and shrubs are depth of the root zone, available water capacity, and wetness. Examples of these plants are oak, poplar, cherry, sweetgum, apple, hawthorn, sassafras, dogwood, hickory, blackberry, blueberry, wild plum, sumac, and persimmon.

Coniferous plants furnish winter cover, browse, and seeds. Soil properties and features that affect the growth of coniferous trees, shrubs, and ground cover are depth of the root zone, available water capacity, and wetness. Examples of coniferous plants are pine, cedar, and juniper.

Wetland plants are annual and perennial wild herbaceous plants that grow on moist or wet sites. Submerged or floating aquatic plants are excluded. Soil properties and features affecting wetland plants are texture of the surface layer, wetness, reaction, salinity, slope, and surface stoniness. Examples of wetland plants are smartweed, wild millet, wildrice, cordgrass, cattail, rushes, and sedges.

Shallow water areas have an average depth of less than 5 feet. Some are naturally wet areas. Others are created by dams, levees, or other water-control structures. Soil properties and features affecting shallow water areas are depth to bedrock, wetness, surface

stoniness, slope, and permeability. Examples of shallow water areas are marshes, waterfowl feeding areas, and ponds.

The habitat for various kinds of wildlife is described in the following paragraphs.

Habitat for openland wildlife consists of cropland, pasture, meadows, and areas that are overgrown with grasses, herbs, shrubs, and vines. These areas produce grain and seed crops, grasses and legumes, and wild herbaceous plants. Wildlife attracted to these areas include bobwhite quail, meadowlark, field sparrow, cottontail, red fox, woodchuck, and mourning dove.

Habitat for woodland wildlife consists of areas of deciduous plants or coniferous plants or both and associated grasses, legumes, and wild herbaceous plants. Wildlife attracted to these areas include wild turkey, ruffed grouse, woodchuck, thrushes, woodpeckers, squirrels, gray fox, raccoon, and deer.

Habitat for wetland wildlife consists of open, marshy or swampy shallow water areas. Some of the wildlife attracted to such areas are ducks, herons, muskrat, mink, and beaver.

Engineering

This section provides information for planning land uses related to urban development and to water management. Soils are rated for various uses, and the most limiting features are identified. The ratings are given in the following tables: Building site development, Sanitary facilities, Construction materials, and Water management. The ratings are based on observed performance of the soils and on the estimated data and test data in the "Soil Properties" section.

Information in this section is intended for land use planning, for evaluating land use alternatives, and for planning site investigations prior to design and construction. The information, however, has limitations. For example, estimates and other data generally apply only to that part of the soil within a depth of 5 or 6 feet. Because of the map scale, small areas of different soils may be included within the mapped areas of a specific soil.

The information is not site specific and does not eliminate the need for onsite investigation of the soils or for testing and analysis by personnel experienced in the design and construction of engineering works.

Government ordinances and regulations that restrict certain land uses or impose specific design criteria were not considered in preparing the information in this section. Local ordinances and regulations need to be considered in planning, in site selection, and in design.

Soil properties, site features, and observed performance were considered in determining the ratings in this section. During the fieldwork for this soil survey, determinations were made about grain-size distribution, liquid limit, plasticity index, soil reaction, depth to bedrock, hardness of bedrock within 5 or 6 feet of the surface, soil wetness, depth to a seasonal high water table, slope, likelihood of flooding, natural soil structure aggregation, and soil density. Data were collected about kinds of clay minerals, mineralogy of the sand and silt fractions, and the kind of adsorbed cations. Estimates were made for erodibility, permeability, corrosivity, shrink-swell potential, available water capacity, and other behavioral characteristics affecting engineering uses.

This information can be used to evaluate the potential of areas for residential, commercial, industrial, and recreation uses; make preliminary estimates of construction conditions; evaluate alternative routes for roads, streets, highways, pipelines, and underground cables; evaluate alternative sites for sanitary landfills, septic tank absorption fields, and sewage lagoons; plan detailed onsite investigations of soils and geology; locate potential sources of gravel, sand, earthfill, and topsoil; plan drainage systems, irrigation systems, ponds, terraces, and other structures for soil and water conservation; and predict performance of proposed small structures and pavements by comparing the performance of existing similar structures on the same or similar soils.

The information in the tables, along with the soil maps, the soil descriptions, and other data provided in this survey, can be used to make additional interpretations.

Some of the terms used in this soil survey have a special meaning in soil science and are defined in the Glossary.

Building Site Development

Table 11 shows the degree and kind of soil limitations that affect shallow excavations, dwellings with and without basements, small commercial buildings, local roads and streets, and lawns and landscaping. The limitations are considered *slight* if soil properties and site features are generally favorable for the indicated use and limitations are minor and easily overcome; *moderate* if soil properties or site features are not favorable for the indicated use and special planning, design, or maintenance is needed to overcome or minimize the limitations; and *severe* if soil

properties or site features are so unfavorable or so difficult to overcome that special design, significant increases in construction costs, and possibly increased maintenance are required. Special feasibility studies may be required where the soil limitations are severe.

Shallow excavations are trenches or holes dug to a maximum depth of 5 or 6 feet for basements, graves, utility lines, open ditches, and other purposes. The ratings are based on soil properties, site features, and observed performance of the soils. The ease of digging, filling, and compacting is affected by the depth to bedrock, a cemented pan, or a very firm dense layer; stone content; soil texture; and slope. The time of the year that excavations can be made is affected by the depth to a seasonal high water table and the susceptibility of the soil to flooding. The resistance of the excavation walls or banks to sloughing or caving is affected by soil texture and the depth to the water table.

Dwellings and *small commercial buildings* are structures built on shallow foundations on undisturbed soil. The load limit is the same as that for single-family dwellings no higher than three stories. Ratings are made for small commercial buildings without basements, for dwellings with basements, and for dwellings without basements. The ratings are based on soil properties, site features, and observed performance of the soils. A high water table, flooding, the shrink-swell potential, and organic layers can cause the movement of footings. A high water table, depth to bedrock or to a cemented pan, large stones, slope, and flooding affect the ease of excavation and construction. Landscaping and grading that require cuts and fills of more than 5 or 6 feet are not considered.

Local roads and streets have an all-weather surface and carry automobile and light truck traffic all year. They have a subgrade of cut or fill soil material, a base of gravel, crushed rock, or stabilized soil material, and a flexible or rigid surface. Cuts and fills are generally limited to less than 6 feet. The ratings are based on soil properties, site features, and observed performance of the soils. The depth to bedrock or to a cemented pan, a high water table, flooding, large stones, and slope affect the ease of excavating and grading. Soil strength (as inferred from the engineering classification of the soil), shrink-swell potential, frost action potential, and depth to a high water table affect the traffic-supporting capacity.

Lawns and landscaping require soils on which turf and ornamental trees and shrubs can be established and maintained. The ratings are based on soil properties, site features, and observed performance of the soils. Soil reaction, a high water table, depth to bedrock or to a cemented pan, the available water capacity in the upper 40 inches, and the content of salts, sodium, and sulfidic material affect plant growth. Flooding, wetness, slope, stoniness, and the amount of sand, clay, or organic matter in the surface layer affect trafficability after vegetation is established.

Sanitary Facilities

Table 12 shows the degree and kind of soil limitations that affect septic tank absorption fields, sewage lagoons, and sanitary landfills. The limitations are considered *slight* if soil properties and site features are generally favorable for the indicated use and limitations are minor and easily overcome; *moderate* if soil properties or site features are not favorable for the indicated use and special planning, design, or maintenance is needed to overcome or minimize the limitations; and *severe* if soil properties or site features are so unfavorable or so difficult to overcome that special design, significant increases in construction costs, and possibly increased maintenance are required.

Table 12 also shows the suitability of the soils for use as daily cover for landfills. A rating of *good* indicates that soil properties and site features are favorable for the use and good performance and low maintenance can be expected; *fair* indicates that soil properties and site features are moderately favorable for the use and one or more soil properties or site features make the soil less desirable than the soils rated good; and *poor* indicates that one or more soil properties or site features are unfavorable for the use and overcoming the unfavorable properties requires special design, extra maintenance, or costly alteration.

Septic tank absorption fields are areas in which effluent from a septic tank is distributed into the soil through subsurface tiles or perforated pipe. Only that part of the soil between depths of 24 and 72 inches is evaluated. The ratings are based on soil properties, site features, and observed performance of the soils. Permeability, a high water table, depth to bedrock or to a cemented pan, and flooding affect absorption of the effluent. Large stones and bedrock or a cemented pan interfere with installation.

Unsatisfactory performance of septic tank absorption fields, including excessively slow absorption of effluent, surfacing of effluent, and hillside seepage, can affect public health. Ground water can be polluted if highly permeable sand and gravel or fractured bedrock is less than 4 feet below the base of the absorption field, if slope is excessive, or if the water table is near the surface. There must be unsaturated soil material

beneath the absorption field to filter the effluent effectively. Many local ordinances require that this material be of a certain thickness.

Sewage lagoons are shallow ponds constructed to hold sewage while aerobic bacteria decompose the solid and liquid wastes. Lagoons should have a nearly level floor surrounded by cut slopes or embankments of compacted soil. Lagoons generally are designed to hold the sewage within a depth of 2 to 5 feet. Nearly impervious soil material for the lagoon floor and sides is required to minimize seepage and contamination of ground water.

Table 12 gives ratings for the natural soil that makes up the lagoon floor. The surface layer and, generally, 1 or 2 feet of soil material below the surface layer are excavated to provide material for the embankments. The ratings are based on soil properties, site features, and observed performance of the soils. Considered in the ratings are slope, permeability, a high water table, depth to bedrock or to a cemented pan, flooding, large stones, and content of organic matter.

Excessive seepage resulting from rapid permeability of the soil or a water table that is high enough to raise the level of sewage in the lagoon causes a lagoon to function unsatisfactorily. Pollution results if seepage is excessive or if floodwater overtops the lagoon. A high content of organic matter is detrimental to proper functioning of the lagoon because it inhibits aerobic activity. Slope and bedrock can cause construction problems, and large stones can hinder compaction of the lagoon floor.

Sanitary landfills are areas where solid waste is disposed of by burying it in soil. There are two types of landfill—trench and area. In a trench landfill, the waste is placed in a trench. It is spread, compacted, and covered daily with a thin layer of soil excavated at the site. In an area landfill, the waste is placed in successive layers on the surface of the soil. The waste is spread, compacted, and covered daily with a thin layer of soil from a source away from the site.

Both types of landfill must be able to bear heavy vehicular traffic. Both types involve a risk of ground-water pollution. Ease of excavation and revegetation needs to be considered.

The ratings in table 12 are based on soil properties, site features, and observed performance of the soils. Permeability, depth to bedrock or to a cemented pan, a high water table, slope, and flooding affect both types of landfill. Texture, stones and boulders, highly organic layers, soil reaction, and content of salts and sodium affect trench type landfills. Unless otherwise stated, the ratings apply only to that part of the soil within a depth of about 6 feet. For deeper trenches, a limitation rated slight or moderate may not be valid. Onsite investigation is needed.

Daily cover for landfill is the soil material that is used to cover compacted solid waste in an area type sanitary landfill. The soil material is obtained offsite, transported to the landfill, and spread over the waste.

Soil texture, wetness, coarse fragments, and slope affect the ease of removing and spreading the material during wet and dry periods. Loamy or silty soils that are free of large stones or excess gravel are the best cover for a landfill. Clayey soils are sticky or cloddy and are difficult to spread; sandy soils are subject to soil blowing.

After soil material has been removed, the soil material remaining in the borrow area must be thick enough over bedrock or the water table to permit revegetation. The soil material used as final cover for a landfill should be suitable for plants. The surface layer generally has the best workability, more organic matter, and the best potential for plants. Material from the surface layer should be stockpiled for use as the final cover.

Construction Materials

Table 13 gives information about the soils as a source of roadfill, sand, gravel, and topsoil. The soils are rated *good, fair,* or *poor* as a source of roadfill and topsoil. They are rated as a *probable* or *improbable* source of sand and gravel. The ratings are based on soil properties and site features that affect the removal of the soil and its use as construction material. Normal compaction, minor processing, and other standard construction practices are assumed. Each soil is evaluated to a depth of 5 or 6 feet.

Roadfill is soil material that is excavated in one place and used in road embankments in another place. In this table, the soils are rated as a source of roadfill for low embankments, generally less than 6 feet high and less exacting in design than higher embankments.

The ratings are for the soil material below the surface layer to a depth of 5 or 6 feet. It is assumed that soil layers will be mixed during excavating and spreading. Many soils have layers of contrasting suitability within their profile. The table showing engineering index properties provides detailed information about each soil layer. This information can help determine the suitability of each layer for use as roadfill. The performance of soil after it is stabilized with lime or cement is not considered in the ratings.

The ratings are based on soil properties, site features, and observed performance of the soils. The

thickness of suitable material is a major consideration. The ease of excavation is affected by large stones, a high water table, and slope. How well the soil performs in place after it has been compacted and drained is determined by its strength (as inferred from the engineering classification of the soil) and the shrink-swell potential.

Soils rated *good* contain significant amounts of sand or gravel or both. They have at least 5 feet of suitable material, a low shrink-swell potential, few cobbles and stones, and slopes of 15 percent or less. Depth to the water table is more than 3 feet. Soils rated *fair* are more than 35 percent silt- and clay-sized particles and have a plasticity index of less than 10. They have a moderate shrink-swell potential, slopes of 15 to 25 percent, or many stones. Depth to the water table is 1 to 3 feet. Soils rated *poor* have a plasticity index of more than 10, a high shrink-swell potential, many stones, or slopes of more than 25 percent. They are wet, and the depth to the water table is less than 1 foot. These soils may have layers of suitable material, but the material is less than 3 feet thick.

Sand and gravel are natural aggregates suitable for commercial use with a minimum of processing. Sand and gravel are used in many kinds of construction. Specifications for each use vary widely. In table 13, only the probability of finding material in suitable quantity is evaluated. The suitability of the material for specific purposes is not evaluated, nor are factors that affect excavation of the material.

The properties used to evaluate the soil as a source of sand or gravel are gradation of grain sizes (as indicated by the engineering classification of the soil), the thickness of suitable material, and the content of rock fragments. Kinds of rock, acidity, and stratification are given in the soil series descriptions. Gradation of grain sizes is given in the table on engineering index properties.

A soil rated as a probable source has a layer of clean sand or gravel or a layer of sand or gravel that is as much as 12 percent silty fines. This material must be at least 3 feet thick and less than 50 percent, by weight, large stones. All other soils are rated as an improbable source. Coarse fragments of soft bedrock, such as shale and siltstone, are not considered to be sand and gravel.

Topsoil is used to cover an area so that vegetation can be established and maintained. The upper 40 inches of a soil is evaluated for use as topsoil. Also evaluated is the reclamation potential of the borrow area.

Plant growth is affected by toxic material and by such properties as soil reaction, available water capacity, and fertility. The ease of excavating, loading, and spreading is affected by rock fragments, slope, a water table, soil texture, and thickness of suitable material. Reclamation of the borrow area is affected by slope, a water table, rock fragments, bedrock, and toxic material.

Soils rated *good* have friable loamy material to a depth of at least 40 inches. They are free of stones and cobbles, have little or no gravel, and have slopes of less than 8 percent. They are low in content of soluble salts, are naturally fertile or respond well to fertilizer, and are not so wet that excavation is difficult.

Soils rated *fair* are sandy soils, loamy soils that have a relatively high content of clay, soils that have only 20 to 40 inches of suitable material, soils that have an appreciable amount of gravel, stones, or soluble salts, or soils that have slopes of 8 to 15 percent. The soils are not so wet that excavation is difficult.

Soils rated *poor* are very sandy or clayey, have less than 20 inches of suitable material, have a large amount of gravel, stones, or soluble salts, have slopes of more than 15 percent, or have a seasonal water table at or near the surface.

The surface layer of most soils is generally preferred for topsoil because of its organic matter content. Organic matter greatly increases the absorption and retention of moisture and nutrients for plant growth.

Water Management

Table 14 gives information on the soil properties and site features that affect water management. The degree and kind of soil limitations are given for pond reservoir areas and for embankments, dikes, and levees. The limitations are considered *slight* if soil properties and site features are generally favorable for the indicated use and limitations are minor and are easily overcome; *moderate* if soil properties or site features are not favorable for the indicated use and special planning, design, or maintenance is needed to overcome or minimize the limitations; and *severe* if soil properties or site features are so unfavorable or so difficult to overcome that special design, significant increase in construction costs, and possibly increased maintenance are required.

This table also gives for each soil the restrictive features that affect drainage, irrigation, terraces and diversions, and grassed waterways.

Pond reservoir areas hold water behind a dam or embankment. Soils best suited to this use have low seepage potential in the upper 60 inches. The seepage potential is determined by the permeability of the soil and the depth to fractured bedrock or other permeable

material. Excessive slope can affect the storage capacity of the reservoir area.

Embankments, dikes, and levees are raised structures of soil material, generally less than 20 feet high, constructed to impound water or to protect land against overflow. In this table, the soils are rated as a source of material for embankment fill. The ratings apply to the soil material below the surface layer to a depth of about 5 feet. It is assumed that soil layers will be uniformly mixed and compacted during construction.

The ratings do not indicate the ability of the natural soil to support an embankment. Soil properties to a depth even greater than the height of the embankment can affect performance and safety of the embankment. Generally, deeper onsite investigation is needed to determine these properties.

Soil material in embankments must be resistant to seepage, piping, and erosion and have favorable compaction characteristics. Unfavorable features include less than 5 feet of suitable material and a high content of stones or boulders, organic matter, or salts or sodium. A high water table affects the amount of usable material. It also affects trafficability.

Drainage is the removal of excess surface and subsurface water from the soil. How easily and effectively the soil is drained depends on the depth to bedrock, to a cemented pan, or to other layers that affect the rate of water movement; permeability; depth to a high water table or depth of standing water if the soil is subject to ponding; slope; susceptibility to flooding; subsidence of organic layers; and potential frost action. Excavating and grading and the stability of ditchbanks are affected by depth to bedrock or to a cemented pan, large stones, slope, and the hazard of cutbanks caving. The productivity of the soil after drainage is adversely affected by extreme acidity. Availability of drainage outlets is not considered in the ratings.

Irrigation is the controlled application of water to supplement rainfall and support plant growth. The design and management of an irrigation system are affected by depth to the water table, the need for drainage, flooding, available water capacity, intake rate, permeability, erosion hazard, and slope. The construction of a system is affected by large stones and depth to bedrock or to a cemented pan. The performance of a system is affected by the depth of the root zone, the amount of salts or sodium, and soil reaction.

Terraces and diversions are embankments or a combination of channels and ridges constructed across a slope to control erosion and conserve moisture by intercepting runoff. Slope, wetness, large stones, and depth to bedrock or to a cemented pan affect the construction of terraces and diversions. A restricted rooting depth, a severe hazard of soil blowing or water erosion, an excessively coarse texture, and restricted permeability adversely affect maintenance.

Grassed waterways are natural or constructed channels, generally broad and shallow, that conduct surface water to outlets at a nonerosive velocity. Large stones, wetness, slope, and depth to bedrock or to a cemented pan affect the construction of grassed waterways. A hazard of soil blowing, low available water capacity, restricted rooting depth, toxic substances such as salts or sodium, and restricted permeability adversely affect the growth and maintenance of the grass after construction.

Soil Properties

Data relating to soil properties are collected during the course of the soil survey. The data and the estimates of soil and water features, listed in tables, are explained on the following pages.

Soil properties are determined by field examination of the soils and by laboratory index testing of some benchmark soils. Established standard procedures are followed. During the survey, many shallow borings are made and examined to identify and classify the soils and to delineate them on the soil maps. Samples are taken from some typical profiles and tested in the laboratory to determine grain-size distribution, plasticity, and compaction characteristics.

Estimates of soil properties are based on field examinations, on laboratory tests of samples from the survey area, and on laboratory tests of samples of similar soils in nearby areas. Tests verify field observations, verify properties that cannot be estimated accurately by field observation, and help characterize key soils.

The estimates of soil properties shown in the tables include the range of grain-size distribution and Atterberg limits, the engineering classification, and the physical and chemical properties of the major layers of each soil. Pertinent soil and water features also are given.

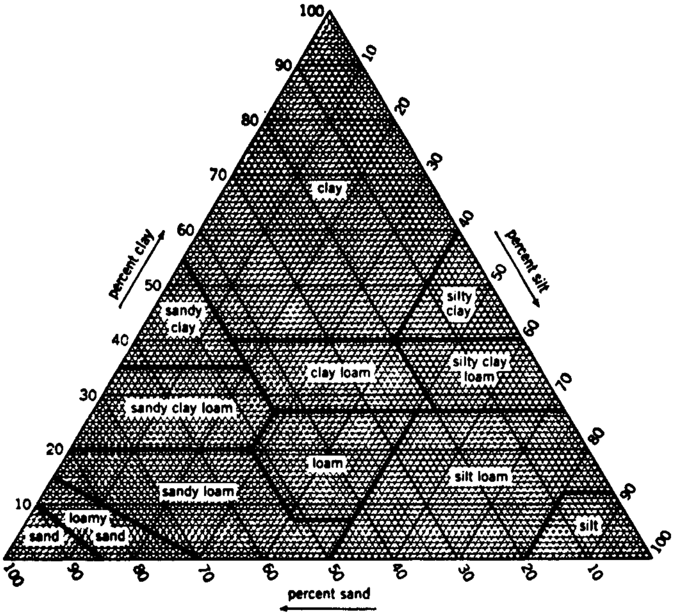

Figure 14.—The percentages of clay, silt, and sand in the basic USDA soil textural classes.

Engineering Index Properties

Table 15 gives estimates of the engineering classification and of the range of index properties for the major layers of each soil in the survey area. Most soils have layers of contrasting properties within the upper 5 or 6 feet.

Depth to the upper and lower boundaries of each layer is indicated. The range in depth and information on other properties of each layer are given for each soil series under "Soil Series and Their Morphology."

Texture is given in the standard terms used by the U.S. Department of Agriculture. These terms are defined according to percentages of sand, silt, and clay in the fraction of the soil that is less than 2 millimeters in diameter (fig. 14). "Loam," for example, is soil that is 7 to 27 percent clay, 28 to 50 percent silt, and less than 52 percent sand. If the content of particles coarser than sand is as much as about 15 percent, an appropriate modifier is added, for example, "gravelly." Textural terms are defined in the Glossary.

Classification of the soils is determined according to the Unified soil classification system *(3)* and the system adopted by the American Association of State Highway and Transportation Officials *(2)*.

The Unified system classifies soils according to properties that affect their use as construction material. Soils are classified according to grain-size distribution of the fraction less than 3 inches in diameter and according to plasticity index, liquid limit, and organic matter content. Sandy and gravelly soils are identified as GW, GP, GM, GC, SW, SP, SM, and SC; silty and clayey soils as ML, CL, OL, MH, CH, and OH; and

highly organic soils as PT. Soils exhibiting engineering properties of two groups can have a dual classification, for example, CL-ML.

The AASHTO system classifies soils according to those properties that affect roadway construction and maintenance. In this system, the fraction of a mineral soil that is less than 3 inches in diameter is classified in one of seven groups from A-1 through A-7 on the basis of grain-size distribution, liquid limit, and plasticity index. Soils in group A-1 are coarse grained and low in content of fines (silt and clay). At the other extreme, soils in group A-7 are fine grained. Highly organic soils are classified in group A-8 on the basis of visual inspection.

If laboratory data are available, the A-1, A-2, and A-7 groups are further classified as A-1-a, A-1-b, A-2-4, A-2-5, A-2-6, A-2-7, A-7-5, or A-7-6. As an additional refinement, the suitability of a soil as subgrade material can be indicated by a group index number. Group index numbers range from 0 for the best subgrade material to 20 or higher for the poorest.

Rock fragments larger than 3 inches in diameter are indicated as a percentage of the total soil on a dry-weight basis. The percentages are estimates determined mainly by converting volume percentage in the field to weight percentage.

Percentage (of soil particles) passing designated sieves is the percentage of the soil fraction less than 3 inches in diameter based on an ovendry weight. The sieves, numbers 4, 10, 40, and 200 (USA Standard Series), have openings of 4.76, 2.00, 0.420, and 0.074 millimeters, respectively. Estimates are based on laboratory tests of soils sampled in the survey area and in nearby areas and on estimates made in the field.

Liquid limit and *plasticity index* (Atterberg limits) indicate the plasticity characteristics of a soil. The estimates are based on test data from the survey area or from nearby areas and on field examination.

The estimates of grain-size distribution, liquid limit, and plasticity index are generally rounded to the nearest 5 percent. Thus, if the ranges of gradation and Atterberg limits extend a marginal amount (1 or 2 percentage points) across classification boundaries, the classification in the marginal zone is omitted in the table.

Physical and Chemical Properties

Table 16 shows estimates of some characteristics and features that affect soil behavior. These estimates are given for the major layers of each soil in the survey area. The estimates are based on field observations and on test data for these and similar soils.

Clay as a soil separate consists of mineral soil particles that are less than 0.002 millimeter in diameter. In this table, the estimated content of clay in each major soil layer is given as a percentage, by weight, of the soil material that is less than 2 millimeters in diameter.

The amount and kind of clay greatly affect the fertility and physical condition of the soil. They determine the ability of the soil to adsorb cations and to retain moisture. They influence shrink-swell potential, permeability, and plasticity, the ease of soil dispersion, and other soil properties. The amount and kind of clay in a soil also affect tillage and earthmoving operations.

Moist bulk density is the weight of soil (ovendry) per unit volume. Volume is measured when the soil is at field moisture capacity, that is, the moisture content at ⅓ bar moisture tension. Weight is determined after drying the soil at 105 degrees C. In this table, the estimated moist bulk density of each major soil horizon is expressed in grams per cubic centimeter of soil material that is less than 2 millimeters in diameter. Bulk density data are used to compute shrink-swell potential, available water capacity, total pore space, and other soil properties. The moist bulk density of a soil indicates the pore space available for water and roots. A bulk density of more than 1.6 can restrict water storage and root penetration. Moist bulk density is influenced by texture, kind of clay, content of organic matter, and soil structure.

Permeability refers to the ability of a soil to transmit water or air. The estimates indicate the rate of downward movement of water when the soil is saturated. They are based on soil characteristics observed in the field, particularly structure, porosity, and texture. Permeability is considered in the design of soil drainage systems, septic tank absorption fields, and construction where the rate of water movement under saturated conditions affects behavior.

Available water capacity refers to the quantity of water that the soil is capable of storing for use by plants. The capacity for water storage is given in inches of water per inch of soil for each major soil layer. The capacity varies, depending on soil properties that affect the retention of water and the depth of the root zone. The most important properties are the content of organic matter, soil texture, bulk density, and soil structure. Available water capacity is an important factor in the choice of plants or crops to be grown and in the design and management of irrigation systems. Available water capacity is not an estimate of the quantity of water actually available to plants at any given time.

Soil reaction is a measure of acidity or alkalinity and

is expressed as a range in pH values. The range in pH of each major horizon is based on many field tests. For many soils, values have been verified by laboratory analyses. Soil reaction is important in selecting crops and other plants, in evaluating soil amendments for fertility and stabilization, and in determining the risk of corrosion.

Shrink-swell potential is the potential for volume change in a soil with a loss or gain in moisture. Volume change occurs mainly because of the interaction of clay minerals with water and varies with the amount and type of clay minerals in the soil. The size of the load on the soil and the magnitude of the change in soil moisture content influence the amount of swelling of soils in place. Laboratory measurements of swelling of undisturbed clods were made for many soils. For others, swelling was estimated on the basis of the kind and amount of clay minerals in the soil and on measurements of similar soils.

If the shrink-swell potential is rated moderate to very high, shrinking and swelling can cause damage to buildings, roads, and other structures. Special design is often needed.

Shrink-swell potential classes are based on the change in length of an unconfined clod as moisture content is increased from air-dry to field capacity. The change is based on the soil fraction less than 2 millimeters in diameter. The classes are *low*, a change of less than 3 percent; *moderate*, 3 to 6 percent; and *high*, more than 6 percent. *Very high*, greater than 9 percent, is sometimes used.

Erosion factor K indicates the susceptibility of a soil to sheet and rill erosion by water. Factor K is one of six factors used in the Universal Soil Loss Equation (USLE) to predict the average annual rate of soil loss by sheet and rill erosion in tons per acre per year. The estimates are based primarily on percentage of silt, sand, and organic matter (up to 4 percent) and on soil structure and permeability. Values of K range from 0.05 to 0.69. The higher the value, the more susceptible the soil is to sheet and rill erosion by water.

Erosion factor T is an estimate of the maximum average annual rate of soil erosion by wind or water that can occur without affecting crop productivity over a sustained period. The rate is in tons per acre per year.

Organic matter is the plant and animal residue in the soil at various stages of decomposition. In table 16, the estimated content of organic matter is expressed as a percentage, by weight, of the soil material that is less than 2 millimeters in diameter.

The content of organic matter in a soil can be maintained or increased by returning crop residue to the soil. Organic matter affects the available water capacity, infiltration rate, and tilth. It is a source of nitrogen and other nutrients for crops.

Soil and Water Features

Table 17 gives estimates of various soil and water features. The estimates are used in land use planning that involves engineering considerations.

Hydrologic soil groups are used to estimate runoff from precipitation. Soils not protected by vegetation are assigned to one of four groups. They are grouped according to the infiltration of water when the soils are thoroughly wet and receive precipitation from long-duration storms.

The four hydrologic soil groups are:

Group A. Soils having a high infiltration rate (low runoff potential) when thoroughly wet. These consist mainly of deep, well drained to excessively drained sands or gravelly sands. These soils have a high rate of water transmission.

Group B. Soils having a moderate infiltration rate when thoroughly wet. These consist chiefly of moderately deep or deep, moderately well drained or well drained soils that have moderately fine texture to moderately coarse texture. These soils have a moderate rate of water transmission.

Group C. Soils having a slow infiltration rate when thoroughly wet. These consist chiefly of soils having a layer that impedes the downward movement of water or soils of moderately fine texture or fine texture. These soils have a slow rate of water transmission.

Group D. Soils having a very slow infiltration rate (high runoff potential) when thoroughly wet. These consist chiefly of clays that have a high shrink-swell potential, soils that have a permanent high water table, soils that have a claypan or clay layer at or near the surface, and soils that are shallow over nearly impervious material. These soils have a very slow rate of water transmission.

Flooding, the temporary inundation of an area, is caused by overflowing streams or by runoff from adjacent slopes. Water standing for short periods after rainfall or snowmelt is not considered flooding, nor is water in swamps and marshes.

Table 17 gives the frequency and duration of flooding and the time of year when flooding is most likely.

Frequency, duration, and probable dates of occurrence are estimated. Frequency is expressed as none, rare, occasional, and frequent. *None* means that flooding is not probable; *rare* that it is unlikely but possible under unusual weather conditions; *occasional*

that it occurs, on the average, once or less in 2 years; and *frequent* that it occurs, on the average, more than once in 2 years. Duration is expressed as *very brief* if less than 2 days, *brief* if 2 to 7 days, and *long* if more than 7 days. Probable dates are expressed in months.

The information is based on evidence in the soil profile, namely thin strata of gravel, sand, silt, or clay deposited by floodwater; irregular decrease in organic matter content with increasing depth; and absence of distinctive horizons that form in soils that are not subject to flooding.

Also considered are local information about the extent and levels of flooding and the relation of each soil on the landscape to historic floods. Information on the extent of flooding based on soil data is less specific than that provided by detailed engineering surveys that delineate flood-prone areas at specific flood frequency levels.

High water table (seasonal) is the highest level of a saturated zone in the soil in most years. The depth to a seasonal high water table applies to undrained soils. The estimates are based mainly on the evidence of a saturated zone, namely grayish colors or mottles in the soil. Indicated in table 17 are the depth to the seasonal high water table; the kind of water table—that is, perched or apparent; and the months of the year that the water table commonly is high. A water table that is seasonally high for less than 1 month is not indicated in table 17. Only saturated zones within a depth of about 6 feet are indicated.

An *apparent* water table is a thick zone of free water in the soil. It is indicated by the level at which water stands in an uncased borehole after adequate time is allowed for adjustment in the surrounding soil. A *perched* water table is water standing above an unsaturated zone. In places an upper, or perched, water table is separated from a lower one by a dry zone.

Depth to bedrock is given if bedrock is within a depth of 5 feet. The depth is based on many soil borings and on observations during soil mapping. The rock is either soft or hard. If the rock is soft or fractured, excavations can be made with trenching machines, backhoes, or small rippers. If the rock is hard or massive, blasting or special equipment generally is needed for excavation.

Potential frost action is the likelihood of upward or lateral expansion of the soil caused by the formation of segregated ice lenses (frost heave) and the subsequent collapse of the soil and loss of strength on thawing. Frost action occurs when moisture moves into the freezing zone of the soil. Temperature, texture, density, permeability, content of organic matter, and depth to the water table are the most important factors considered in evaluating the potential for frost action. It is assumed that the soil is not insulated by vegetation or snow and is not artificially drained. Silty and highly structured clayey soils that have a high water table in winter are the most susceptible to frost action. Well drained, very gravelly, or very sandy soils are the least susceptible. Frost heave and low soil strength during thawing cause damage mainly to pavements and other rigid structures.

Risk of corrosion pertains to potential soil-induced electrochemical or chemical action that dissolves or weakens uncoated steel or concrete. The rate of corrosion of uncoated steel is related to such factors as soil moisture, particle-size distribution, acidity, and electrical conductivity of the soil. The rate of corrosion of concrete is based mainly on the sulfate and sodium content, texture, moisture content, and acidity of the soil. Special site examination and design may be needed if the combination of factors creates a severe corrosion environment. The steel in installations that intersect soil boundaries or soil layers is more susceptible to corrosion than steel in installations that are entirely within one kind of soil or within one soil layer.

For uncoated steel, the risk of corrosion, expressed as *low*, *moderate*, or *high*, is based on soil drainage class, total acidity, electrical resistivity near field capacity, and electrical conductivity of the saturation extract.

For concrete, the risk of corrosion also is expressed as *low*, *moderate*, or *high*. It is based on soil texture, acidity, and amount of sulfates in the saturation extract.

Classification of the Soils

The system of soil classification used by the National Cooperative Soil Survey has six categories *(28)*. Beginning with the broadest, these categories are the order, suborder, great group, subgroup, family, and series. Classification is based on soil properties observed in the field or inferred from those observations or from laboratory measurements. Table 18 shows the classification of the soils in the survey area. The categories are defined in the following paragraphs.

ORDER. Eleven soil orders are recognized. The differences among orders reflect the dominant soil-forming processes and the degree of soil formation. Each order is identified by a word ending in *sol*. An example is Entisol.

SUBORDER. Each order is divided into suborders primarily on the basis of properties that influence soil genesis and are important to plant growth or properties that reflect the most important variables within the orders. The last syllable in the name of a suborder indicates the order. An example is Fluvent (*Fluv*, meaning river, plus *ent*, from Entisol).

GREAT GROUP. Each suborder is divided into great groups on the basis of close similarities in kind, arrangement, and degree of development of pedogenic horizons; soil moisture and temperature regimes; and base status. Each great group is identified by the name of a suborder and by a prefix that indicates a property of the soil. An example is Udifluvents (*Udi*, meaning humid, plus *fluvent*, the suborder of the Entisols that is on flood plains).

SUBGROUP. Each great group has a typic subgroup. Other subgroups are intergrades or extragrades. The typic is the central concept of the great group; it is not necessarily the most extensive. Intergrades are transitions to other orders, suborders, or great groups. Extragrades have some properties that are not representative of the great group but do not indicate transitions to any other known kind of soil. Each subgroup is identified by one or more adjectives preceding the name of the great group. The adjective *Typic* identifies the subgroup that typifies the great group. An example is Typic Udifluvents.

FAMILY. Families are established within a subgroup on the basis of physical and chemical properties and other characteristics that affect management. Generally, the properties are those of horizons below plow depth where there is much biological activity. Among the properties and characteristics considered are particle-size class, mineral content, temperature regime, depth of the root zone, consistence, moisture equivalent, slope, and permanent cracks. A family name consists of the name of a subgroup preceded by terms that indicate soil properties. An example is loamy-skeletal, mixed, nonacid, mesic Typic Udifluvents.

SERIES. The series consists of soils that have similar horizons in their profile. The horizons are similar in color, texture, structure, reaction, consistence, mineral and chemical composition, and arrangement in the profile. The texture of the surface layer or of the substratum can differ within a series.

Soil Series and Their Morphology

In this section, each soil series recognized in the survey area is described. The descriptions are arranged in alphabetic order.

Characteristics of the soil and the material in which it formed are identified for each series. A pedon, a small three-dimensional area of soil, that is typical of the series in the survey area is described. The detailed description of each soil horizon follows standards in the *Soil Survey Manual (26)*. Many of the technical terms used in the descriptions are defined in *Soil Taxonomy (28)*. Unless otherwise stated, colors in the descriptions are for moist soil. Following the pedon description is the range of important characteristics of the soils in the series.

The map units of each soil series are described in the section "Detailed Soil Map Units."

Auxvasse Series

The Auxvasse series consists of deep, somewhat poorly drained soils on stream terraces. These soils

formed in loess or silty and clayey alluvium. Permeability is very slow. Slopes range from 0 to 3 percent.

Typical pedon of Auxvasse silt loam, 0 to 3 percent slopes, in a fallow field; 2,000 feet east and 1,600 feet south of the northwest corner of sec. 36, T. 35 N., R. 3 E.

Ap—0 to 8 inches; dark brown (10YR 4/3) silt loam; moderate fine granular structure; friable; many fine roots; slightly acid; abrupt smooth boundary.

E—8 to 16 inches; brown (10YR 5/3) silt loam; moderate fine granular structure; friable; many fine roots; few fine concretions of manganese oxide; medium acid; abrupt smooth boundary.

B/E—16 to 20 inches; brown (10YR 4/3) silty clay ped interiors (Bt) and light brownish gray (10YR 6/2) silt coatings (E) on faces of peds; strong fine subangular blocky structure; firm; common fine roots; strongly acid; abrupt smooth boundary.

Btg—20 to 33 inches; grayish brown (2.5Y 5/2) silty clay; many fine prominent strong brown (7.5YR 5/6) mottles; moderate fine and very fine subangular blocky structure; very firm; common fine roots; medium acid; clear smooth boundary.

Cg—33 to 60 inches; light brownish gray (2.5Y 6/2) silty clay loam; common coarse prominent yellowish brown (10YR 5/4) and few fine prominent strong brown (7.5YR 5/6) mottles; weak fine subangular blocky structure; firm; few fine roots; medium acid.

The Ap horizon has value of 4 or 5 and chroma of 2 or 3. The E horizon has hue of 10YR or 2.5Y, value of 5 or 6, and chroma of 2 or 3. The B/E horizon has properties similar to those of the E and Bt horizons, but chroma of the Bt part ranges from 3 to 6. The Btg horizon has hue of 10YR or 2.5Y, value of 4 or 5, and chroma of 1 or 2. It is silty clay or clay. The Cg horizon has hue of 10YR or 2.5Y, value of 5 or 6, and chroma of 1 or 2. It is silty clay loam or silt loam.

Bloomsdale Series

The Bloomsdale series consists of deep, well drained soils on flood plains. These soils formed in gravelly and cobbly alluvium washed from mountainous uplands of igneous origin. Permeability is moderate. Slopes range from 0 to 4 percent.

Typical pedon of Bloomsdale very gravelly loam, 0 to 4 percent slopes, in an area of mixed hardwood forest on the flood plain along Taum Sauk Creek; 2,600 feet south and 50 feet east of the northwest corner of sec. 30, T. 33 N., R. 3 E.

A—0 to 8 inches; brown (7.5YR 4/2) very gravelly loam; weak fine granular structure parting to single grain; very friable and loose; common fine roots; about 35 percent gravel and 5 percent cobbles; slightly acid; clear wavy boundary.

C—8 to 24 inches; brown (7.5YR 4/2) very gravelly sandy loam; weak fine granular structure parting to single grain; very friable and loose; common fine roots; about 35 percent gravel and 5 percent cobbles; slightly acid; clear wavy boundary.

2Btb—24 to 60 inches; dark brown (7.5YR 4/4) extremely cobbly clay; weak fine and medium granular structure; friable and firm; few clay films on faces of peds; common medium roots in the upper part and few fine roots below a depth of 3 feet; about 25 percent gravel, 50 percent cobbles, and 5 to 10 percent small stones; neutral.

The A horizon has hue of 10YR or 7.5YR and chroma of 2 or 3. It is dominantly very gravelly loam, but gravelly loam and the gravelly and very gravelly analogs of sandy loam are within the range. The C horizon has hue of 7.5YR or 10YR, value of 3 or 4, and chroma of 2 to 4. It is very gravelly or extremely gravelly sandy loam that in some pedons has a few lenses or thin layers of the gravelly or very gravelly analogs of sandy loam or loamy sand. Depth to the 2Btb horizon ranges from 20 to 40 inches. This horizon has value of 4 or 5 and chroma of 2 to 4.

Clarksville Series

The Clarksville series consists of deep, somewhat excessively drained soils on highly dissected uplands. These soils formed in cherty and loamy colluvium or in old sediments and possibly in material weathered from cherty limestone. Permeability is moderately rapid in the upper part of the profile and moderate in the lower part. Slopes range from 25 to 50 percent.

Typical pedon of Clarksville very cherty silt loam, 25 to 50 percent slopes, in an oak-hickory forest on a south-facing slope; 2,300 feet west and 2,100 feet south of the northeast corner of sec. 11, T. 32 N., R. 3 E.

A—0 to 3 inches; dark brown (10YR 4/3) very cherty silt loam, brown (10YR 5/3) dry; moderate fine granular structure; very friable; many very fine roots; about 40 percent rock fragments; medium acid; clear wavy boundary.

E—3 to 16 inches; pale brown (10YR 6/3) very cherty silt loam; moderate fine granular structure; friable; many fine roots; about 45 percent rock fragments;

strongly acid; clear wavy boundary.

Bt1—16 to 38 inches; brown (7.5YR 5/4) very cherty silt loam; moderate fine subangular blocky structure; firm; common medium roots; about 60 percent rock fragments; few faint brown clay films on faces of peds; very strongly acid; gradual wavy boundary.

Bt2—38 to 58 inches; strong brown (7.5YR 4/6) very cherty silty clay loam; moderate fine subangular blocky structure; firm; common fine roots; about 40 percent rock fragments; common faint clay films on faces of peds; extremely acid; gradual wavy boundary.

2Bt3—58 to 68 inches; yellowish red (5YR 4/6) very cherty clay; common fine prominent red (2.5YR 4/8) mottles; moderate fine subangular blocky structure; very firm; few fine roots; about 35 percent rock fragments; common faint clay films on faces of peds; extremely acid.

The A horizon has value of 3 or 4 and chroma of 2 or 3, and the E horizon has value of 5 to 7 and chroma of 2 or 3. Both of these horizons are the cherty or very cherty analogs of silt loam or loam. The Bt horizon has hue of 10YR, 7.5YR, or 5YR and value and chroma of 4 to 6. It is the very cherty or extremely cherty analogs of silt loam or silty clay loam. The 2Bt horizon has hue of 2.5YR to 10YR, value of 3 to 6, and chroma of 4 to 6. It is the cherty, very cherty, or extremely cherty analogs of silty clay or clay.

Courtois Series

The Courtois series consists of deep, well drained soils in upland basins and on valley side slopes. These soils formed in loess and clayey sediments. Permeability is moderate. Slopes range from 3 to 14 percent.

Typical pedon of Courtois silt loam, 9 to 14 percent slopes, in a mixed hardwood forest on a west-facing slope; 1,850 feet south and 50 feet west of the northeast corner of sec. 8, T. 34 N., R. 3 E.

A—0 to 2 inches; very dark grayish brown (10YR 3/2) silt loam, grayish brown (10YR 5/2) dry; strong fine granular structure; friable; common medium roots; neutral; abrupt smooth boundary.

BE—2 to 10 inches; dark brown (7.5YR 4/4) silt loam; weak fine subangular blocky structure parting to weak fine granular; friable; common medium roots; medium acid; clear smooth boundary.

Bt1—10 to 17 inches; reddish brown (5YR 4/4) silty clay; moderate very fine subangular blocky structure; firm; common fine roots; about 10 percent chert fragments less than 3 inches in size; medium acid; abrupt smooth boundary.

2Bt2—17 to 28 inches; dark red (2.5YR 3/6) very cherty clay; common fine prominent strong brown (7.5YR 5/6) mottles; strong very fine angular blocky structure; very firm; common fine roots; common distinct clay films on faces of peds; few fine black stains; about 50 percent chert fragments (25 percent less than ¾ inch, 15 percent ¾ inch to 3 inches, 10 percent 3 to 10 inches in size); strongly acid; clear wavy boundary.

3Bt3—28 to 42 inches; dark red (2.5YR 3/6) clay; many medium prominent strong brown (7.5YR 5/6) mottles; strong very fine angular blocky structure; very firm; common fine roots; few pressure faces; many distinct clay films on faces of peds; few fine black stains; about 2 percent chert fragments less than 3 inches in size; strongly acid; clear wavy boundary.

3Bt4—42 to 60 inches; dark red (2.5YR 3/6) clay; many medium prominent strong brown (7.5YR 5/6) mottles; moderate medium subangular blocky structure; firm, few fine roots; common pressure faces; many distinct clay films on faces of peds; many medium black stains; about 2 percent chert fragments less than 3 inches in size; strongly acid.

The thickness of the silty overburden and depth to the 2Bt horizon (and to a stone line) range from about 16 to 30 inches.

The A or Ap horizon has hue of 10YR to 5YR, value of 3 or 4, and chroma of 2 to 4. It is dominantly silt loam, but cherty silt loam is within the range. The content of rock fragments ranges from 0 to 25 percent.

The BE horizon has hue of 7.5YR or 5YR, value of 4 or 5, and chroma of 4 to 6. The texture and the content of chert fragments are similar to those of the A horizon.

The Bt horizon has hue of 5YR or 7.5YR, value of 3 or 4, and chroma of 4 to 6. It is silty clay loam or silty clay. The content of chert fragments ranges from 0 to 10 percent.

The 2Bt and 3Bt horizons have hue of 10R or 2.5YR, value of 3 or 4, and chroma of 4 to 6. A stone line (the 2Bt horizon in the typical pedon) is very cherty clay, cherty clay, or very cherty silty clay. It has 25 to 60 percent rounded chert fragments. In some pedons it is characterized by weak brittleness and a slightly higher bulk density. The 3Bt horizon is clay or cherty clay. It has 0 to 20 percent rounded and angular chert fragments.

Crider Series

The Crider series consists of deep, well drained soils on ridges in the uplands. These soils formed in loess and clayey material and in the underlying material weathered from limestone. Permeability is moderate. Slopes range from 2 to 9 percent.

Typical pedon of Crider silt loam, 2 to 5 percent slopes, in a hay field on an east-facing slope; 550 feet east and 2,200 feet north of the southwest corner of sec. 30, T. 35 N., R. 3 E.

Ap—0 to 7 inches; dark brown (10YR 4/3) silt loam, pale brown (10YR 6/3) dry; moderate fine granular structure; friable; many fine roots; slightly acid; abrupt smooth boundary.

BA—7 to 12 inches; dark brown (7.5YR 4/4) silt loam; weak fine subangular blocky structure; friable; many fine roots; medium acid; clear smooth boundary.

Bt1—12 to 19 inches; strong brown (7.5YR 4/6) silty clay loam; weak fine subangular blocky structure; friable; common fine roots; medium acid; clear wavy boundary.

Bt2—19 to 33 inches; yellowish red (5YR 4/6) silty clay loam; strong fine subangular blocky structure; firm; common fine roots; strongly acid; clear smooth boundary.

2Bt3—33 to 49 inches; yellowish red (5YR 4/6) clay; weak fine prismatic structure parting to moderate fine subangular blocky; very firm; few fine roots; common faint dark reddish brown clay films on faces of peds; few fine black stains and concretions of iron and manganese oxide; slightly acid; gradual smooth boundary.

2Bt4—49 to 72 inches; yellowish red (5YR 4/6) clay; moderate fine and very fine subangular blocky structure; very firm; many distinct dark reddish brown clay films on faces of peds; many fine black stains and concretions of iron and manganese oxide; slightly acid.

The content of gravel fragments commonly is 0 to 2 percent in the A, BA, and Bt horizons and ranges from 0 to 10 percent in the 2Bt horizon. These are chert fragments.

The Ap or A horizon has hue of 10YR or 7.5YR, value of 4 or 5, and chroma of 2 to 4. The BA horizon, if it occurs, has value of 4 or 5.

The Bt horizon has value of 4 or 5 and chroma of 4 to 6. It is silt loam or silty clay loam. The 2Bt horizon has hue of 7.5YR to 2.5YR, value of 3 to 5, and chroma of 4 to 6. In some pedons it has silt coatings on faces of peds.

Dameron Series

The Dameron series consists of deep, well drained soils on flood plains. These soils formed in loamy alluvium and in the underlying cherty alluvium. Permeability is moderately slow. Slopes range from 0 to 3 percent.

Typical pedon of Dameron silt loam, clayey substratum, 0 to 3 percent slopes, in a mixed hardwood woodlot; 50 feet south and 1,325 feet east of the northwest corner of sec. 35, T. 35 N., R. 2 E.

A1—0 to 11 inches; very dark grayish brown (10YR 3/2) silt loam, grayish brown (10YR 5/2) dry; moderate medium and fine granular structure; very friable; many fine roots; about 3 percent chert gravel; neutral; clear smooth boundary.

A2—11 to 23 inches; very dark grayish brown (10YR 3/2) silt loam, grayish brown (10YR 5/2) dry; moderate fine subangular blocky structure; very friable; many fine roots; about 8 percent fine chert gravel; neutral; clear smooth boundary.

A3—23 to 29 inches; very dark grayish brown (10YR 3/2) silty clay loam, dark brown (10YR 3/3) crushed, grayish brown (10YR 5/2) dry; moderate fine and very fine subangular blocky structure; firm; common fine roots; about 14 percent fine chert; neutral; clear smooth boundary.

2C1—29 to 36 inches; dark brown (10YR 3/3) very cherty silty clay loam, brown (10YR 5/3) dry; many very dark gray (10YR 3/1) organic stains; weak fine and very fine subangular blocky structure; firm; common fine roots; about 50 percent fine chert; neutral; abrupt smooth boundary.

2C2—36 to 44 inches; brown (10YR 4/3) cherty clay loam; common very dark gray (10YR 3/1) organic stains; massive; firm; few fine roots; about 25 percent fine chert; neutral; clear smooth boundary.

2C3—44 to 60 inches; brown (10YR 4/3) very cherty clay; many very dark gray (10YR 3/1) organic stains; massive; firm; few fine roots; about 60 percent chert; neutral.

The thickness of the mollic epipedon ranges from 24 to about 36 inches. Depth to the underlying cherty material ranges from 25 to 40 inches. The content of gravel ranges from 2 to 15 percent in the A horizon and from 25 to 60 percent in the C horizon.

The A horizon has value and chroma of 2 or 3. It is silt loam or silty clay loam. The 2C horizon has value of 3 or 4 and chroma of 2 to 4. It is dominantly the cherty or very cherty analogs of silty clay loam, loam, or clay

loam, but cherty or very cherty clay is common at a depth of 3 to 4 feet.

Delassus Series

The Delassus series consists of deep, moderately well drained soils on foot slopes. These soils formed in loess and loamy colluvial material. They have a fragipan. Permeability is moderately slow above the fragipan and very slow in the fragipan. Slopes range from 3 to 14 percent.

Typical pedon of Delassus silt loam, 3 to 9 percent slopes, in a pasture on a south-facing slope; 450 feet east and 1,500 feet north of the southwest corner of sec. 13, T. 33 N., R. 4 E.

A—0 to 2 inches; very dark grayish brown (10YR 3/2) silt loam, light brownish gray (10YR 6/2) dry; moderate fine granular structure; friable; many coarse roots; slightly acid; abrupt smooth boundary.

E—2 to 6 inches; yellowish brown (10YR 5/4) silt loam; weak fine granular structure; friable; many coarse roots; medium acid; abrupt smooth boundary.

Bt1—6 to 17 inches; brown (7.5YR 4/4) silty clay loam; moderate fine and very fine subangular blocky structure; friable; many coarse roots; strongly acid; clear smooth boundary.

Bt2—17 to 24 inches; brown (7.5YR 4/4) silty clay loam; moderate medium subangular blocky structure; firm; common coarse roots; few distinct clay films on faces of peds; very strongly acid; clear smooth boundary.

Bt3—24 to 29 inches; brown (10YR 4/3) silty clay loam; common fine distinct yellowish brown (10YR 5/6) mottles; moderate fine and medium subangular blocky structure; firm; many coarse roots; few distinct clay films; very strongly acid; clear smooth boundary.

2Ex—29 to 35 inches; grayish brown (10YR 5/2) loam; common fine prominent yellowish brown (10YR 5/6) mottles; weak thick platy structure with massive interiors; firm; brittle; few medium roots; few distinct clay films along vertical cracks; about 2 percent gravel less than ¾ inch in size; very strongly acid; abrupt irregular boundary.

2Btx—35 to 65 inches; yellowish brown (10YR 5/4) loam; many coarse distinct grayish brown (10YR 5/2) mottles; moderate very coarse prismatic structure with massive interiors; firm, hard; brittle; few fine roots along vertical cracks; few distinct clay films in vertical cracks; very strongly acid.

The depth to bedrock ranges from 48 to more than 90 inches. Depth to the fragipan ranges from 25 to 36 inches. The content of rock fragments ranges from 0 to 10 percent in the Bt horizon and from 0 to 35 percent in the fragipan.

The A horizon has value of 3 or 4 and chroma of 2 or 3. The Bt horizon has value of 4 or 5 and chroma of 3 to 6. It is silt loam, silty clay loam, or clay loam. The 2Ex horizon has hue of 10YR or 7.5YR, value of 5 or 6, and chroma of 2 to 4. It is loam, silt loam, silty clay loam, or the gravelly analogs of those textures. The 2Btx horizon has hue of 10YR or 7.5YR, value of 5 or 6, and chroma of 4 to 8. It is loam, silt loam, silty clay loam, sandy clay loam, or the gravelly analogs of those textures.

Fourche Series

The Fourche series consists of deep, moderately well drained soils on ridges and side slopes. These soils formed in loess and in the underlying clayey sediments. Permeability is moderately slow. Slopes range from 2 to 9 percent.

Typical pedon of Fourche silt loam, 2 to 5 percent slopes, in an abandoned field on a west-facing slope; 300 feet east and 3,000 feet north of the southwest corner of sec. 3, T. 34 N., R. 3 E.

Ap—0 to 5 inches; dark grayish brown (10YR 4/2) silt loam; moderate fine granular structure; friable; many fine roots; slightly acid; abrupt smooth boundary.

E—5 to 10 inches; yellowish brown (10YR 5/4) silt loam; weak fine granular structure; friable; common fine roots; slightly acid; clear smooth boundary.

BE—10 to 14 inches; strong brown (7.5YR 5/6) silt loam; weak fine subangular blocky structure; friable; common fine roots; medium acid; clear wavy boundary.

Bt—14 to 20 inches; brown (7.5YR 5/4) silty clay loam; moderate fine subangular blocky structure; friable; few fine roots; strongly acid; clear wavy boundary.

2B/E—20 to 34 inches; brown (7.5YR 4/4) silty clay loam (Bt); light brownish gray (10YR 6/2) silt loam (E) on faces of peds; weak fine subangular blocky structure; friable; few fine roots; common distinct clay films on faces of peds; very strongly acid; clear smooth boundary.

2Bt1—34 to 48 inches; reddish brown (5YR 4/4) clay, brown (7.5YR 4/4) kneaded; common medium grayish brown (10YR 5/2) mottles; moderate fine subangular blocky structure; firm; few fine roots;

common fine black stains; slightly acid; gradual smooth boundary.

2Bt2—48 to 65 inches; strong brown (7.5YR 5/6) clay; weak very fine subangular blocky structure; firm; common fine black stains and concretions of iron and manganese oxide; neutral.

The thickness of the loess and depth to the clayey 2Bt horizon range from about 18 to 34 inches. The A horizon has chroma of 2 or 3. The Bt horizon has hue of 10YR or 7.5YR, value of 4 or 5, and chroma of 3 to 6. It typically is silty clay loam but in some pedons is silt loam. The 2Bt horizon has hue of 7.5YR or 5YR, value of 4 or 5, and chroma of 4 to 6. It typically is clay or silty clay but in some pedons is silty clay loam.

Gasconade Series

The Gasconade series consists of shallow, somewhat excessively drained soils on side slopes and a few ridges in the uplands. These soils formed in a thin layer of clayey material that has a considerable number of coarse fragments from the underlying dolomite bedrock. Permeability is moderately slow. Slopes range from 5 to 20 percent.

Typical pedon of Gasconade flaggy silty clay loam, 5 to 20 percent slopes, extremely stony, in a glade; 100 feet north and 650 feet west of the southeast corner of sec. 10, T. 32 N., R. 4 E.

A—0 to 6 inches; very dark grayish brown (10YR 3/2) flaggy silty clay loam, dark grayish brown (10YR 4/2) dry; strong fine granular structure; very friable; many fine roots; about 5 percent gravel and 10 percent flagstones; stones cover about 5 percent of the surface; neutral; clear wavy boundary.

Bw—6 to 18 inches; very dark grayish brown (10YR 3/2) very flaggy silty clay; moderate very fine subangular blocky structure; firm; common fine roots; about 5 percent gravel and 50 percent flagstones; neutral; abrupt irregular boundary.

R—18 inches; hard dolomite bedrock.

The depth to bedrock ranges from 4 to 20 inches. The content of rock fragments averages 35 percent or more, by volume.

The A horizon has chroma of 2 or 3. It typically is flaggy silty clay loam but in some pedons is flaggy clay loam. The B horizon has hue of 10YR or 2.5Y, value of 3 or 4, and chroma of 2 or 3. It is the very flaggy analogs of silty clay loam, silty clay, or clay. The content of rock fragments in this horizon ranges from 35 to 60 percent.

Gatewood Series

The Gatewood series consists of moderately deep, moderately well drained soils on ridges and side slopes in the uplands. These soils formed in a thin mantle of loess and in the underlying clayey sediments. Permeability is slow. Slopes range from 2 to 20 percent.

Typical pedon of Gatewood silt loam, 5 to 9 percent slopes, in a mixed hardwood forest on a north-facing slope; 1,200 feet north and 125 feet west of the southeast corner of sec. 26, T. 35 N., R. 2 E.

A—0 to 3 inches; very dark grayish brown (10YR 3/2) silt loam, light brownish gray (10YR 6/2) dry; strong fine granular structure; friable; many coarse roots; neutral; abrupt wavy boundary.

E—3 to 6 inches; brown (7.5YR 4/4) silt loam; moderate fine granular structure; friable; common coarse roots; medium acid; abrupt wavy boundary.

2Bt1—6 to 17 inches; yellowish red (5YR 4/6) clay; strong fine and very fine subangular blocky structure; firm; common coarse roots; about 1 percent chert pebbles; medium acid; clear smooth boundary.

2Bt2—17 to 25 inches; dark brown (7.5YR 4/4) clay; many fine distinct brown (10YR 4/3) mottles; moderate very fine subangular blocky structure; very firm; common coarse roots; about 2 percent chert pebbles; common fine black stains and concretions of iron and manganese oxide; slightly acid; clear wavy boundary.

2Bt3—25 to 29 inches; dark yellowish brown (10YR 4/4) clay; common medium faint dark grayish brown (10YR 4/2) mottles; strong very fine subangular blocky structure; very firm; common coarse roots; common faint clay films; common slickensides; common fine concretions of iron and manganese oxide; about 2 percent chert pebbles; neutral; abrupt irregular boundary.

2R—29 inches; hard dolomite bedrock.

The depth to bedrock ranges from 20 to 40 inches. The A horizon has value of 3 or 4 and chroma of 2 or 3. The E horizon, if it occurs, has hue of 7.5YR or 10YR and chroma of 3 or 4. The 2Bt horizon has value of 4 or 5 and chroma of 4 to 6. It is silty clay, clay, or the cherty analogs of those textures. It commonly has 5 to 35 percent chert.

Goss Series

The Goss series consists of deep, well drained soils on side slopes in the uplands. These soils formed in

cherty, reddish clay. Permeability is moderate. Slopes range from 14 to 35 percent.

Typical pedon of Goss very cherty silt loam, 14 to 35 percent slopes, in an oak-hickory forest on a southeast-facing side slope; 1,650 feet east and 1,150 feet north of the southwest corner of sec. 32, T. 35 N., R. 2 E.

A—0 to 2 inches; dark grayish brown (10YR 4/2) very cherty silt loam, light brownish gray (10YR 6/2) dry; moderate fine granular structure; friable; many fine roots; about 40 percent chert fragments; medium acid; abrupt wavy boundary.

E—2 to 9 inches; light yellowish brown (10YR 6/4) very cherty silt loam, white (10YR 8/2) dry; moderate very fine granular structure; friable; many fine roots; about 35 percent chert fragments; medium acid; clear wavy boundary.

Bt1—9 to 17 inches; red (2.5YR 4/6) very cherty silty clay; many coarse distinct yellowish red (5YR 5/6) mottles; strong very fine subangular blocky structure; firm; common fine roots; many faint clay films in pores and on faces of peds; about 50 percent chert fragments; strongly acid; clear wavy boundary.

Bt2—17 to 28 inches; dark red (2.5YR 3/6) very cherty clay; moderate fine subangular blocky structure; very firm; few fine roots; many faint clay films on faces of peds; about 50 percent chert fragments; strongly acid; diffuse wavy boundary.

Bt3—28 to 79 inches; dark red (2.5YR 3/6) very cherty clay; common medium prominent brownish yellow (10YR 6/8) mottles; moderate fine subangular blocky structure; very firm; very few fine roots; common faint clay films on faces of peds; about 50 percent chert fragments; strongly acid.

The A horizon has chroma of 2 or 3. The content of coarse fragments in this horizon ranges from 15 to 60 percent. The E horizon has value of 5 or 6 and chroma of 3 or 4. The content of coarse fragments in this horizon ranges from 20 to 70 percent. The Bt horizon has value of 3 to 5. The content of coarse fragments ranges from 20 to 80 percent in individual subhorizons. The weighted average in the upper 20 inches of the Bt horizon is more than 35 percent.

Irondale Series

The Irondale series consists of moderately deep, well drained soils on upland side slopes in mountainous areas. These soils formed in loamy material weathered from igneous rocks. Permeability is moderate. Slopes range from 15 to 40 percent.

Typical pedon of Irondale very cobbly silt loam, 15 to 40 percent slopes, rubbly, on a south-facing slope in a forest of post oak, northern red oak, and hickory; 1,000 feet north and 1,400 feet west of the southeast corner of sec. 21, T. 34 N., R. 2 E.

A—0 to 3 inches; very dark grayish brown (10YR 3/2) very cobbly silt loam, grayish brown (10YR 5/2) dry; weak medium granular structure; very friable; many fine and medium roots; about 43 percent coarse fragments; strongly acid; abrupt smooth boundary.

E—3 to 8 inches; brown (10YR 5/3) very cobbly silt loam; weak very fine and fine subangular blocky structure; very friable; common medium roots; about 45 percent coarse fragments; very strongly acid; clear wavy boundary.

Bt1—8 to 16 inches; yellowish brown (10YR 5/4) very cobbly silt loam; weak fine and very fine subangular blocky structure; friable; common medium roots; common distinct clay films on faces of peds; about 50 percent coarse fragments; very strongly acid; clear wavy boundary.

Bt2—16 to 23 inches; reddish brown (5YR 4/4) very cobbly silt loam; weak fine subangular blocky structure; friable; common medium roots; common distinct clay films on faces of peds; about 50 percent coarse fragments; very strongly acid; abrupt wavy boundary.

BC—23 to 35 inches; brown (7.5YR 4/4) very cobbly silt loam; many medium distinct strong brown (7.5YR 5/6) and pale brown (10YR 6/3) mottles; weak thick platy structure; firm; few fine roots; about 50 percent coarse fragments; very strongly acid; abrupt wavy boundary.

R—35 inches; hard rhyolite.

The content of rock fragments, mainly cobbles and pebbles, ranges from 15 to 60 percent in the A horizon and from 35 to 60 percent in the Bt and BC horizons. The A horizon has hue of 10YR or 7.5YR, value of 3 or 4, and chroma of 2 or 3. The Bt horizon has hue of 10YR to 5YR, value of 4 or 5, and chroma of 4 to 6. The fine-earth fraction of this horizon is silt loam, silty clay loam, or clay loam. The BC horizon generally has hue of 10YR to 5YR but in a few pedons has hue of 2.5Y. It has value of 4 to 6 and chroma of 3 to 8. The fine-earth fraction of this horizon is silt loam, loam, or clay loam.

Killarney Series

The Killarney series consists of deep, moderately well drained soils on foot slopes. These soils formed in loess and colluvium derived from rhyolite and other igneous rocks. They have a fragipan. Permeability is moderately slow above the fragipan and very slow in the fragipan. Slopes range from 14 to 50 percent.

Typical pedon of Killarney very cobbly silt loam, 14 to 50 percent slopes, rubbly, in a mixed hardwood and pine forest on a northeast-facing slope; 1,500 feet south and 2,700 feet east of the northwest corner of sec. 31, T. 33 N., R. 3 E.

Oi—2 inches to 0; slightly decomposed layer of leaves, twigs, roots, and other organic material.

A—0 to 3 inches; dark grayish brown (10YR 4/2) very cobbly silt loam, light brownish gray (10YR 6/2) dry; moderate fine granular structure; many fine roots; about 43 percent rock fragments; stones cover about 5 percent of the surface; medium acid; abrupt smooth boundary.

E—3 to 7 inches; brown (10YR 5/3) very cobbly silt loam; moderate fine and medium granular structure; friable; common fine roots; about 55 percent rock fragments; medium acid; clear smooth boundary.

BE—7 to 12 inches; yellowish brown (10YR 5/4) very cobbly silt loam; weak medium subangular blocky structure parting to moderate fine granular; friable; common fine roots; about 55 percent rock fragments; strongly acid; clear wavy boundary.

Bt1—12 to 25 inches; strong brown (7.5YR 5/6) very cobbly silty clay loam; weak fine subangular blocky structure; friable; many fine roots; few faint clay films on faces of peds; about 45 percent rock fragments; very strongly acid; gradual wavy boundary.

Bt2—25 to 31 inches; strong brown (7.5YR 5/6) very cobbly silty clay loam; moderate fine and very fine subangular blocky structure; firm; common fine roots; common distinct clay films on faces of peds; about 40 percent rock fragments; very strongly acid; clear wavy boundary.

Bt3—31 to 36 inches; yellowish brown (10YR 5/4) very gravelly silty clay loam; weak very fine subangular blocky structure; friable; common fine and medium roots; common distinct clay films on surfaces of rock fragments and faces of peds; about 55 percent rock fragments; extremely acid; abrupt wavy boundary.

Btx1—36 to 57 inches; light yellowish brown (10YR 6/4) very gravelly silt loam; common medium prominent strong brown (7.5YR 5/6) and few fine distinct light brownish gray (10YR 6/2) mottles; massive; brittle; very hard; many prominent clay films lining vesicular pores; about 50 percent rock fragments; extremely acid; diffuse wavy boundary.

Btx2—57 to 80 inches; light yellowish brown (10YR 6/4) very gravelly silt loam; common medium distinct gray (10YR 6/1) mottles; massive; brittle; very hard; common distinct clay films lining vesicular pores; about 35 percent rock fragments; very strongly acid.

The content of rock fragments, mainly cobbles and pebbles, ranges from 35 to 60 percent throughout the profile. The A horizon has value of 4 or 5 and chroma of 2 or 3. The E horizon has value of 5 or 6 and chroma of 3 or 4. The Bt horizon has hue of 10YR to 5YR, value of 5 or 6, and chroma of 4 to 6. The fine-earth fraction of this horizon is silty clay loam or silt loam. The Btx horizon has value of 5 or 6. The fine-earth fraction of this horizon is silt loam, loam, or clay loam.

Knobtop Series

The Knobtop series consists of moderately deep, moderately well drained soils on mountainous ridgetops. These soils formed in loess and in loamy material weathered from rhyolite and other igneous rocks. Permeability is moderately slow. Slopes range from 3 to 12 percent.

Typical pedon of Knobtop silt loam, 3 to 9 percent slopes, on a south-facing slope in a forest of post oak, black oak, and hickory; 2,300 feet north and 925 feet east of the southwest corner of sec. 24, T. 35 N., R. 1 E.

Oi—1 inch to 0; slightly decomposed layer of leaves, twigs, roots, and other organic material.

A—0 to 2 inches; dark grayish brown (10YR 4/2) silt loam, light brownish gray (10YR 6/2) dry; weak fine granular structure; very friable; common fine and medium roots; very strongly acid; abrupt smooth boundary.

E—2 to 7 inches; brown (10YR 5/3) silt loam; weak thin and medium platy structure; very friable; common medium roots; very strongly acid; abrupt smooth boundary.

Bt1—7 to 13 inches; brown (7.5YR 5/4) silt loam; weak medium subangular blocky structure; friable; common medium roots; few faint clay films on faces of peds; very strongly acid; clear smooth boundary.

Bt2—13 to 21 inches; brown (7.5YR 4/4) silty clay loam; weak fine and medium subangular blocky structure; firm; common medium roots; common faint clay films on faces of peds; very strongly acid; clear smooth boundary.

Bt3—21 to 26 inches; brown (7.5YR 4/4) silty clay loam; common fine and medium prominent grayish brown (10YR 5/2) and brown (10YR 5/3) mottles; weak medium subangular blocky structure; firm; common medium roots; common faint clay films on faces of peds; very strongly acid; clear smooth boundary.

Bt4—26 to 30 inches; grayish brown (10YR 5/2) silty clay loam; common medium prominent brown (7.5YR 4/4) and strong brown (7.5YR 5/8) mottles; weak thick platy structure parting to weak fine subangular blocky; firm; few fine roots; common prominent clay films on vertical faces of peds; extremely acid; clear smooth boundary.

2BC—30 to 36 inches; light brownish gray (2.5Y 6/2) silt loam; common medium prominent yellowish red (5YR 4/6) and dark brown (7.5YR 4/4) mottles; weak thick platy structure parting to weak medium subangular blocky; firm; few fine roots; 1- to 2-centimeter mat of partially decayed fine and medium roots along the lower boundary; about 13 percent gravel and 1 percent cobbles; extremely acid; abrupt irregular boundary.

2R—36 inches; hard, igneous felsite.

The depth to hard, igneous bedrock ranges from 20 to 40 inches. The content of rock fragments ranges from 0 to 10 percent in the upper part of the profile and from 5 to 60 percent in the 2BC horizon.

The A horizon has value of 3 or 4 and chroma of 2 or 3. The E horizon has hue of 10YR or 7.5YR, value of 4 or 5, and chroma of 3 to 6. The Bt horizon has hue of 10YR or 7.5YR, value of 4 or 5, and chroma of 2 to 6. The 2BC horizon has hue of 7.5YR, 10YR, or 2.5Y, value of 4 to 6, and chroma of 2 to 6. It is silt loam, silty clay loam, loam, clay loam, or the cobbly or very cobbly analogs of those textures.

Lamotte Series

The Lamotte series consists of deep, well drained soils on ridges in the uplands. These soils formed in a thin layer of loess and in the underlying loamy material. Permeability is moderately slow. Slopes range from 3 to 9 percent.

Typical pedon of Lamotte silt loam, 3 to 9 percent slopes, in an alfalfa hay field on a northwest-facing slope; 950 feet west and 2,700 feet south of the northeast corner of sec. 32, T. 35 N., R. 3 E.

Ap—0 to 8 inches; dark brown (10YR 3/3) silt loam, pale brown (10YR 6/3) dry; weak fine granular structure; friable; common fine roots; neutral; clear smooth boundary.

Bt1—8 to 14 inches; reddish brown (5YR 4/4) loam; moderate fine subangular blocky structure; friable; common fine roots; common faint clay films on faces of peds; few fine concretions of iron and manganese oxide; slightly acid; clear smooth boundary.

Bt2—14 to 26 inches; reddish brown (5YR 4/4) clay loam; moderate medium subangular blocky structure; firm; common fine roots; many faint clay films on faces of peds; few medium black stains; strongly acid; clear wavy boundary.

Bt3—26 to 58 inches; reddish brown (2.5YR 4/4) clay loam; moderate medium subangular blocky structure; firm; few fine roots; common faint clay films on faces of peds; common medium black stains; medium acid; abrupt wavy boundary.

Bt4—58 to 62 inches; red (2.5YR 4/6) clay loam; weak fine subangular blocky structure; friable; few fine roots; strongly acid; abrupt wavy boundary.

R—62 inches; hard sandstone bedrock.

The A or Ap horizon has hue of 10YR or 7.5YR, value of 3 or 4, and chroma of 2 to 4. The Bt horizon has hue of 7.5YR to 2.5YR, value of 3 to 5, and chroma of 4 to 8. It is silty clay loam, clay loam, loam, or sandy clay loam. The content of coarse fragments ranges from 0 to 15 percent in this horizon.

Lebanon Series

The Lebanon series consists of deep, moderately well drained soils on the tops of ridges in the uplands. These soils formed in loess and in the underlying cherty and clayey material. They have a fragipan. Permeability is moderately slow above the fragipan and very slow in the fragipan. Slopes range from 3 to 9 percent.

Typical pedon of Lebanon silt loam, 3 to 9 percent slopes, in an abandoned field; 550 feet north and 2,600 feet west of the southeast corner of sec. 27, T. 35 N., R. 2 W.

Ap—0 to 5 inches; brown (10YR 4/3) silt loam, pale brown (10YR 6/3) dry; moderate fine granular structure; friable; many fine roots; slightly acid; abrupt wavy boundary.

BE—5 to 8 inches; strong brown (7.5YR 5/6) silt loam; moderate very fine subangular blocky structure; friable; many coarse roots; very strongly acid; clear smooth boundary.

Bt1—8 to 18 inches; brown (7.5YR 4/4) silty clay loam; strong fine subangular blocky structure; firm; few faint clay films on faces of peds; common medium roots; very strongly acid; clear wavy boundary.

Bt2—18 to 22 inches; grayish brown (10YR 5/2) silty clay; common medium prominent brown (7.5YR 4/4) mottles; moderate fine subangular blocky structure; firm; few faint clay films on faces of peds; many medium roots; very strongly acid; abrupt smooth boundary.

Bt3—22 to 25 inches; grayish brown (10YR 5/2) silty clay loam; common medium prominent yellowish red (5YR 5/6) mottles; moderate thin platy structure; friable; few faint clay films on faces of peds; common medium roots; about 5 percent chert fragments; very strongly acid; abrupt smooth boundary.

2Ex—25 to 37 inches; pale brown (10YR 6/3) extremely cherty silt loam; massive; hard; brittle; few fine roots; about 70 percent rock fragments; very strongly acid; abrupt smooth boundary.

2Btx—37 to 45 inches; yellowish brown (10YR 5/4) cherty silty clay loam; strong coarse prismatic structure parting to moderate medium platy; hard; brittle; many distinct clay films on faces of peds; about 25 percent chert fragments; very strongly acid; clear smooth boundary.

2Bt—45 to 60 inches; yellowish brown (10YR 5/6) cherty silty clay; moderate fine subangular blocky structure; hard, firm; common distinct clay films on faces of peds; about 33 percent rock fragments; strongly acid.

Depth to the fragipan ranges from 22 to 30 inches. The content of chert ranges from 0 to 20 percent in the horizons above the fragipan and from 5 to 60 percent in and below the fragipan.

The A horizon has value of 3 or 4 and chroma of 2 or 3. The BE horizon has value of 5 or 6 and chroma of 4 to 6. The Bt horizon has chroma of 2 to 6. It is silty clay loam, silty clay, or the cherty analogs of those textures. The 2Ex and 2Btx horizons have value of 4 to 6 and chroma of 1 to 4. They are silt loam, silty clay loam, or the cherty or very cherty analogs of those textures. The 2Bt horizon has hue of 7.5YR or 10YR, value of 4 to 6, and chroma of 3 to 6. It is silty clay, clay, or the cherty or very cherty analogs of those textures.

Loughboro Series

The Loughboro series consists of deep, poorly drained soils on upland plateaus and mountain divides. These soils formed in loess and in the underlying clayey and loamy material. Permeability is slow. Slopes range from 0 to 3 percent.

Typical pedon of Loughboro silt loam, 0 to 3 percent slopes, in a pasture; 1,175 feet east and 1,475 feet south of the northwest corner of sec. 21, T. 34 N., R. 4 E.

Ap—0 to 8 inches; dark grayish brown (10YR 4/2) silt loam, light gray (10YR 7/2) dry; few fine prominent dark yellowish brown (10YR 4/6) mottles; moderate fine granular structure; friable; many fine roots; few fine concretions of manganese oxide; neutral; abrupt smooth boundary.

E—8 to 11 inches; yellowish brown (10YR 5/4) silt loam; few fine distinct dark yellowish brown (10YR 4/6) mottles; weak fine granular structure; friable; common fine roots; few fine concretions of manganese oxide; neutral; abrupt smooth boundary.

B/E—11 to 15 inches; grayish brown (10YR 5/2) silty clay (Bt); light brownish gray (10YR 6/2) silt coatings less than 1 millimeter in size, white (10YR 8/1) dry (E); few fine prominent dark yellowish brown (10YR 4/6) mottles; moderate fine subangular blocky structure; firm; common fine roots; very strongly acid; clear wavy boundary.

Btg—15 to 28 inches; grayish brown (2.5Y 5/2) clay; common medium prominent dark yellowish brown (10YR 4/6) mottles; moderate very fine subangular blocky structure; very firm; common fine roots; common distinct clay films on faces of peds; very strongly acid; abrupt smooth boundary.

2Cg1—28 to 39 inches; light brownish gray (2.5Y 6/2) silty clay loam; many coarse prominent yellowish brown (10YR 5/6) mottles; weak thick platy structure; hard; thin white silt coatings; very strongly acid; gradual smooth boundary.

2Cg2—39 to 60 inches; light brownish gray (2.5Y 6/2) silty clay loam; common fine prominent strong brown (7.5YR 5/8) and many coarse prominent yellowish brown (10YR 5/6) mottles; massive; very firm; few fine igneous pebbles; very strongly acid.

The A or Ap horizon has chroma of 2 or 3. The Bt part of the B/E horizon has value of 5 or 6 and chroma of 2 to 4. It is silty clay or silty clay loam. The Btg horizon is clay or silty clay. The 2Cg horizon has hue of 10YR or 2.5Y and value of 5 or 6. It is silt loam, silty clay loam, or loam. The content of igneous rock

fragments, commonly less than ¾ inch in size, is less than 5 percent in this horizon.

Lowell Series

The Lowell series consists of deep, moderately well drained soils on the broad tops of ridges in the uplands. These soils formed in a thin mantle of loess and in the underlying clayey material. Permeability is moderately slow. Slopes range from 2 to 5 percent.

Typical pedon of Lowell silt loam, 2 to 5 percent slopes, in a pasture on a west-facing slope; 100 feet west and 600 feet south of the northeast corner of sec. 35, T. 35 N., R. 2 E.

Ap—0 to 6 inches; dark brown (10YR 4/3) silt loam, light yellowish brown (10YR 6/4) dry; moderate fine granular structure; friable; many fine roots; neutral; abrupt smooth boundary.

E—6 to 10 inches; yellowish brown (10YR 5/4) silt loam; weak very fine granular structure; friable; many fine roots; neutral; clear smooth boundary.

Bt1—10 to 14 inches; brown (7.5YR 5/4) silty clay loam; strong very fine subangular blocky structure; friable; few faint clay films on faces of peds; many fine roots; slightly acid; abrupt smooth boundary.

2Bt2—14 to 19 inches; dark brown (7.5YR 4/4) clay; moderate fine and very fine subangular blocky structure; very firm; common fine roots; common faint clay films on faces of peds; few 10-millimeter vertical cracks filled with pale brown (10YR 6/3) silt loam; less than 1 percent chert pebbles; strongly acid; clear smooth boundary.

2Bt3—19 to 38 inches; dark yellowish brown (10YR 4/4) clay; moderate fine and very fine angular blocky structure; very firm; few fine roots; common distinct clay films on faces of peds; common pressure faces and slickensides; less than 1 percent chert pebbles and cobbles; strongly acid; clear smooth boundary.

2Bt4—38 to 57 inches; dark yellowish brown (10YR 4/6) clay; weak fine and very fine subangular blocky structure; very firm; few fine roots; few distinct clay films on faces of peds; common slickensides; common fine black stains; less than 1 percent chert pebbles and cobbles; neutral; abrupt smooth boundary.

3R—57 inches; hard dolomite; weakly effervescent.

The depth to bedrock ranges from 40 to more than 80 inches. The A or Ap horizon has value of 3 or 4 and chroma of 2 to 4. The E horizon has value of 4 or 5 and chroma of 3 or 4. The Bt horizon has hue of 10YR or 7.5YR, value of 4 or 5, and chroma of 4 to 6. The 2Bt horizon has value of 4 or 5 and chroma of 3 to 6. It is silty clay or clay.

Midco Series

The Midco series consists of deep, somewhat excessively drained soils on flood plains. These soils formed in cherty alluvium washed from the adjacent cherty uplands. Permeability is moderately rapid. Slopes range from 0 to 3 percent.

Typical pedon of Midco cherty loam, 0 to 3 percent slopes, in a pasture; 600 feet south and 700 feet east of the northwest corner of sec. 23, T. 32 N., R. 3 E.

Ap—0 to 7 inches; dark brown (10YR 3/3) cherty loam, pale brown (10YR 6/3) dry; moderate fine granular structure; friable; many fine roots; about 25 percent chert fragments less than 3 inches in size; medium acid; clear smooth boundary.

C1—7 to 15 inches; brown (7.5YR 4/4) very cherty loam; moderate fine granular structure; friable; common fine roots; about 35 percent chert fragments less than 3 inches in size; slightly acid; clear wavy boundary.

C2—15 to 40 inches; brown (7.5YR 4/4) extremely cherty sandy loam; weak fine granular structure; very friable; common fine roots; about 75 percent chert fragments; slightly acid; gradual smooth boundary.

C3—40 to 60 inches; brown (7.5YR 4/4) extremely cherty loam, dark yellowish brown (10YR 4/4) kneaded; massive; very friable; about 75 percent chert fragments; neutral.

The content of rock fragments ranges from 20 to 50 percent in the A horizon and from 35 to 85 percent in the C horizon. The Ap or A horizon has value of 3 or 4 and chroma of 2 or 3. The fine-earth fraction of this horizon is loam or silt loam. The C horizon has hue of 10YR or 7.5YR, value of 4 or 5, and chroma of 3 or 4. The fine-earth fraction of this horizon is dominantly sandy loam or loam, but individual subhorizons may be loamy sand.

Secesh Series

The Secesh series consists of deep, well drained soils on stream terraces. These soils formed in loamy and cherty alluvium. Permeability is moderate. Slopes range from 1 to 4 percent.

The Secesh soils in this county have a higher pH in

the lower part of the 2B horizon than is defined as the range for the series. This difference, however, does not alter the use and management of the soils.

Typical pedon of Secesh silt loam, 1 to 4 percent slopes, in a fescue pasture; 1,450 feet east and 2,450 feet south of the northwest corner of sec. 20, T. 33 N., R. 4 E.

Ap—0 to 7 inches; brown (10YR 4/3) silt loam, light yellowish brown (10YR 6/4) dry; moderate thin platy structure parting to weak fine granular; friable; common worm channels; many fine roots; about 10 percent chert fragments; slightly acid; clear smooth boundary.

Bt1—7 to 13 inches; dark brown (7.5YR 4/4) silt loam; moderate medium subangular blocky structure; friable; common worm channels; many fine and few coarse roots; about 2 percent chert fragments; medium acid; clear smooth boundary.

Bt2—13 to 30 inches; strong brown (7.5YR 5/6) silty clay loam; moderate fine and medium subangular blocky structure; firm; common worm channels; common coarse roots; common faint clay films on faces of peds and in worm channels; about 10 percent chert fragments; medium acid; gradual wavy boundary.

2Bt3—30 to 42 inches; dark yellowish brown (10YR 4/4) extremely cherty sandy clay; pockets of yellowish brown (10YR 5/4) loam; weak very fine subangular blocky structure; friable; common fine roots; common faint clay films on faces of peds and on rock surfaces; about 75 percent chert fragments; medium acid; clear wavy boundary.

2Bt4—42 to 60 inches; dark yellowish brown (10YR 4/4) extremely cherty sandy clay; few fine prominent strong brown (7.5YR 5/8) mottles; weak fine prismatic structure; friable; few fine roots in the upper part; common distinct clay films on faces of peds and on rock surfaces; many black stains of oxide on faces of peds and on rock surfaces; about 75 percent chert fragments; neutral.

The content of rock fragments ranges from 0 to 15 percent in the A and Bt horizons and from 35 to 80 percent in the 2Bt horizon. The A horizon has value and chroma of 3 or 4. It typically is silt loam, but loam is within the range. The Bt horizon has hue of 10YR to 5YR, value of 4 or 5, and chroma of 4 to 6. It is silt loam, silty clay loam, or clay loam. Depth to the 2Bt horizon ranges from 24 to 36 inches. This horizon has colors similar to those of the Bt horizon. It is the very cherty or extremely cherty analogs of silty clay loam, clay loam, or sandy clay.

Syenite Series

The Syenite series consists of moderately deep, well drained soils on side slopes in the uplands. These soils formed in a thin layer of loess and in loamy material weathered from granite. Permeability is moderately slow. Slopes range from 10 to 25 percent.

Typical pedon of Syenite silt loam, 10 to 25 percent slopes, extremely bouldery, in a mixed hardwood forest; 450 feet west and 2,500 feet south of the northeast corner of sec. 10, T. 34 N., R. 3 E.

A—0 to 2 inches; dark grayish brown (10YR 4/2) silt loam, light brownish gray (10YR 6/2) dry; moderate fine granular structure; friable; many fine roots; about 2 percent fine gravel; strongly acid; abrupt smooth boundary.

E—2 to 6 inches; yellowish brown (10YR 5/4) silt loam; moderate medium and fine granular structure; friable; many fine roots; about 2 percent fine gravel; strongly acid; clear smooth boundary.

Bt1—6 to 19 inches; strong brown (7.5YR 5/6) silty clay loam; weak fine subangular blocky structure; firm; few old root channels; many medium roots; few faint clay films on faces of peds; about 5 percent fine gravel; very strongly acid; clear smooth boundary.

2Bt2—19 to 25 inches; brown (7.5YR 5/4) clay loam; weak fine subangular blocky structure; firm; many coarse roots; few distinct clay films on faces of peds; about 12 percent fine gravel; extremely acid; clear smooth boundary.

2Bt3—25 to 31 inches; pale brown (10YR 6/3) gravelly clay loam; common coarse distinct dark brown (7.5YR 4/4) mottles; weak thick platy structure; firm; some brittleness; common fine roots along horizontal surfaces; common prominent clay films on horizontal plates; about 30 percent gravel; extremely acid; abrupt wavy boundary.

2R—31 inches; hard, red granite.

The depth to granite bedrock ranges from 25 to 35 inches. The content of gravel ranges from 0 to 10 percent in the A, E, and Bt horizons and from 5 to about 35 percent in the 2Bt horizon.

The A horizon has value of 3 or 4 and chroma of 2 or 3. The E horizon has value of 4 or 5. The Bt and 2Bt horizons have value of 4 to 6 and chroma of 3 to 6. The Bt horizon is silty clay loam or silt loam. The 2Bt

horizon is clay loam, sandy clay loam, loam, or the gravelly analogs of those textures.

Taumsauk Series

The Taumsauk series consists of shallow, somewhat excessively drained soils on mountainous slopes. These soils formed in loess and in a thin layer of material weathered from rhyolite bedrock. Permeability is moderate. Slopes range from 15 to 35 percent.

Typical pedon of Taumsauk very cobbly silt loam, in an area of Taumsauk-Irondale-Rock outcrop complex, 15 to 40 percent slopes, rubbly; on a south-facing slope that supports native grasses, mosses, lichens, and a few scattered black hickory and eastern redcedar; 1,300 feet east and 1,150 feet north of the southwest corner of sec. 3, T. 33 N., R. 3 E.

A—0 to 6 inches; very dark grayish brown (10YR 3/2) very cobbly silt loam, brown (10YR 5/3) dry; strong fine granular structure; very friable; many fine roots; about 25 percent gravel and 25 percent cobbles; stones cover about 15 percent of the surface; medium acid; clear smooth boundary.

Bt1—6 to 11 inches; dark brown (7.5YR 4/4) very cobbly silt loam; moderate medium subangular blocky structure; friable; common medium roots; few faint clay films on faces of peds; about 20 percent gravel, 30 percent cobbles, and 10 percent stones; medium acid; clear smooth boundary.

Bt2—11 to 16 inches; dark yellowish brown (10YR 4/4) very cobbly silty clay loam; few fine prominent reddish brown (5YR 4/4) mottles; moderate fine subangular blocky structure; friable; common medium roots; few faint clay films on faces of peds; about 20 percent gravel, 30 percent cobbles, and 10 percent stones; strongly acid; abrupt irregular boundary.

R—16 inches; hard rhyolite bedrock.

The depth to bedrock ranges from about 4 to 20 inches. Rock fragments make up 15 to about 50 percent of the A horizon and 35 to 60 percent of the Bt horizon, by volume.

The A horizon has value of 2 to 4 (4 to 6 dry) and chroma of 2 to 4. It is the gravelly, very gravelly, cobbly, or very cobbly analogs of silt loam. The Bt1 horizon and the BA horizon, if it occurs, have hue of 7.5YR or 10YR and chroma of 2 to 6. They are very gravelly or very cobbly silt loam. The Bt2 horizon has hue of 10YR or 7.5YR, value of 4 or 5, and chroma of 4 to 6. It is the very gravelly or very cobbly analogs of silt loam or silty clay loam.

Viburnum Series

The Viburnum series consists of deep, somewhat poorly drained soils on ridges in the uplands. These soils formed in a thin mantle of loess, in cherty, loamy and clayey sediments, and in red, cherty and clayey sediments. Permeability is moderately slow. Slopes range from 3 to 9 percent.

Typical pedon of Viburnum silt loam, 3 to 9 percent slopes, on a roadbank in an oak-hickory forest; 600 feet east and 800 feet north of the southwest corner of sec. 31, T. 35 N., R. 2 E.

A—0 to 3 inches; dark grayish brown (10YR 4/2) silt loam; weak fine granular structure; friable; many fine and medium roots; medium acid; abrupt wavy boundary.

E—3 to 7 inches; yellowish brown (10YR 5/4) silt loam; weak fine granular structure; friable; common medium roots; about 1 percent chert fragments; strongly acid; abrupt smooth boundary.

Bt1—7 to 15 inches; brown (7.5YR 4/4) silty clay loam; weak fine subangular blocky structure; firm; common medium roots; few faint clay films on faces of peds; about 10 percent chert fragments; very strongly acid; clear wavy boundary.

Bt2—15 to 20 inches; brown (7.5YR 4/4) cherty silty clay loam; common fine distinct pale brown (10YR 6/3) mottles; moderate fine subangular blocky structure; firm; common medium roots; common distinct clay films on faces of peds; about 15 percent chert fragments; very strongly acid; clear smooth boundary.

2Bt3—20 to 38 inches; brown (7.5YR 4/4) very cherty silty clay; common fine prominent grayish brown (10YR 5/2) mottles; moderate fine subangular blocky structure; very firm; common medium roots; common distinct clay films on faces of peds; about 45 percent chert fragments; very strongly acid; abrupt smooth boundary.

3Bt4—38 to 60 inches; red (2.5YR 4/6) extremely cherty clay; many fine white soft specks; very dark gray organic stains at a depth of about 54 inches; weak medium subangular blocky structure; very firm; few fine roots; common distinct clay films; about 70 percent chert fragments; extremely acid.

The depth to red clay ranges from 24 to more than 40 inches. The content of rock fragments ranges, by volume, from 0 to 15 percent in the A and E horizons, from 0 to 25 percent in the Bt horizon, from 15 to 60 percent in the 2Bt horizon, and from 25 to 80 percent in the 3Bt horizon.

The A horizon has value of 3 to 5 and chroma of 2 or 3. The E horizon has hue of 10YR or 7.5YR, value of 5 or 6, and chroma of 3 or 4. The Bt horizon has hue of 10YR or 7.5YR, value of 4 or 5, and chroma of 4 to 6. It is silty clay loam or cherty silty clay loam. The 2Bt horizon has hue of 5YR to 10YR, value of 4 or 5, and chroma of 4 to 6. It is the cherty or very cherty analogs of silty clay loam, silty clay, or clay. The 3Bt horizon has hue of 10R to 5YR, value of 3 or 4, and chroma of 4 to 8. It is the cherty to extremely cherty analogs of silty clay or clay.

Viraton Series

The Viraton series consists of deep, moderately well drained soils on foot slopes. These soils formed in loamy and clayey colluvium washed from the adjacent uplands. They have a fragipan. Permeability is moderate above the fragipan and very slow in the fragipan. Slopes range from 3 to 9 percent.

Typical pedon of Viraton silt loam, 3 to 9 percent slopes, in a fescue pasture on a north-facing slope; 100 feet south and 1,100 feet east of the northwest corner of sec. 25, T. 33 N., R. 4 E.

Ap—0 to 4 inches; brown (10YR 4/3) silt loam; common fine distinct dark brown (7.5YR 3/4) mottles; weak thin platy structure parting to weak fine granular; very friable; many fine roots; about 1 percent fine chert fragments; neutral; abrupt wavy boundary.

E—4 to 8 inches; yellowish brown (10YR 5/4) silt loam; weak thin platy structure parting to weak fine granular; friable; many fine roots; about 1 percent fine chert fragments; slightly acid; abrupt wavy boundary.

Bt1—8 to 15 inches; strong brown (7.5YR 5/6) silty clay loam; moderate medium subangular blocky structure; firm; many fine roots; few faint clay films on faces of peds; about 1 percent fine chert fragments; strongly acid; clear smooth boundary.

Bt2—15 to 21 inches; yellowish brown (10YR 5/6) silty clay loam; moderate fine subangular blocky structure; firm; many fine roots; few faint clay films on faces of peds; about 1 percent chert fragments; very strongly acid; abrupt smooth boundary.

Bt3—21 to 31 inches; grayish brown (10YR 5/2) silty clay loam; many medium distinct dark yellowish brown (10YR 4/4) mottles; weak medium platy structure parting to moderate very fine subangular blocky; firm; common fine roots; common prominent clay films on faces of peds and in root channels; about 4 percent chert fragments less than ¾ inch in size; very strongly acid; abrupt smooth boundary.

2Btx—31 to 59 inches; yellowish brown (10YR 5/4) very cherty silt loam; grayish brown (10YR 5/2) streaks and mottles; massive; hard; brittle; few fine roots along vertical cracks; common distinct clay films on the surfaces of rock fragments; about 60 percent chert fragments (25 percent less than ¾ inch, 25 percent ¾ inch to 3 inches, and 10 percent 3 to 10 inches in size); very strongly acid; gradual wavy boundary.

2Bt—59 to 71 inches; yellowish brown (10YR 5/4) cherty silty clay; many medium and coarse prominent yellowish red (5YR 5/6) mottles; strong fine and very fine subangular blocky structure; very firm; few fine roots; many prominent clay films on faces of peds; about 15 percent chert fragments; slightly acid.

Depth to the fragipan ranges from 20 to 32 inches. The content of coarse fragments ranges from 0 to 5 percent above the fragipan, from 25 to 70 percent in the fragipan, and from 5 to 70 percent below the fragipan.

The A or Ap horizon has value of 3 to 5 and chroma of 3 or 4. The E or BE horizon has hue of 10YR or 7.5YR, value of 4 or 5, and chroma of 4 to 6. The Bt horizon has value of 4 or 5. It generally has chroma of 4 to 6, but in some pedons it has chroma of 2 in the lower part. It is silt loam or silty clay loam. The 2Btx horizon has hue of 10YR to 5YR, value of 4 to 6, and chroma of 2 to 6. The fine-earth fraction of this horizon is silt loam or silty clay loam. The 2Bt horizon has hue of 10YR to 2.5YR and value and chroma of 3 to 6. The fine-earth fraction of this horizon is silty clay loam, silty clay, or clay.

Wakeland Series

The Wakeland series consists of deep, somewhat poorly drained soils on flood plains. These soils formed in silty alluvium. Permeability is moderate. Slopes range from 0 to 2 percent.

Typical pedon of Wakeland silt loam, 950 feet east and 2,150 feet north of the southwest corner of sec. 2, T. 34 N., R. 3 E.

Ap—0 to 5 inches; dark grayish brown (10YR 4/2) silt loam, light gray (10YR 7/2) dry; moderate fine granular structure; friable; many fine roots; slightly acid; clear smooth boundary.

C—5 to 18 inches; brown (10YR 5/3) silt loam; few fine

faint light brownish gray (10YR 6/2) mottles; weak fine granular structure; friable; common fine roots; medium acid; clear wavy boundary.

Cg1—18 to 38 inches; light brownish gray (10YR 6/2) silt loam; many medium distinct brown (10YR 5/3) and few medium prominent dark reddish brown (5YR 3/4) mottles; weak fine subangular blocky structure; friable; few fine roots; common fine concretions of iron oxide; neutral; clear smooth boundary.

Cg2—38 to 60 inches; grayish brown (10YR 5/2) silt loam; common medium prominent brown (7.5YR 4/4) and few medium prominent dark reddish brown (5YR 3/4) mottles; massive; friable; few fine roots; neutral.

The A or Ap horizon has chroma of 2 or 3. The C horizon has value of 4 to 6 and chroma of 2 to 4.

Wilderness Series

The Wilderness series consists of deep, moderately well drained soils on ridges and side slopes in the uplands. These soils formed in cherty, loamy sediments. They have a fragipan. Permeability is moderate above the fragipan and slow in the fragipan. Slopes range from 5 to 30 percent.

Typical pedon of Wilderness very cherty silt loam, 14 to 30 percent slopes, on an east-facing slope in a mixed hardwood forest; 1,900 feet south and 650 feet west of the northeast corner of sec. 13, T. 34 N., R. 2 E.

A—0 to 6 inches; brown (10YR 4/3) very cherty silt loam; moderate fine granular structure; friable; many fine roots; about 40 percent chert fragments; medium acid; clear smooth boundary.

E—6 to 16 inches; yellowish brown (10YR 5/4) very cherty silt loam; moderate fine granular structure; friable; many fine roots; about 60 percent chert fragments (45 percent less than 3 inches in size); strongly acid; clear smooth boundary.

Bt—16 to 22 inches; yellowish red (5YR 5/6) extremely cherty silty clay loam; moderate fine subangular blocky structure; firm; common fine roots; few faint clay films on faces of peds; about 65 percent chert fragments (50 percent less than 3 inches and 15 percent 3 to 10 inches in size); very strongly acid; clear smooth boundary.

Bx—22 to 33 inches; reddish yellow (7.5YR 6/6) very cherty silt loam; massive; hard; brittle; few fine roots in vertical cracks; about 55 percent chert fragments (25 percent less than 3 inches and 30 percent 3 to 10 inches in size); very strongly acid; clear wavy boundary.

2Bt1—33 to 51 inches; strong brown (7.5YR 5/6) extremely cherty silty clay, yellowish red (5YR 5/8) kneaded; common medium distinct yellowish red (5YR 4/6) mottles and common coarse prominent light brownish gray (10YR 6/2) mottles and streaks; weak fine subangular blocky structure; hard, firm; common distinct clay films on faces of peds; about 70 percent rock fragments (50 percent less than 3 inches, 15 percent 3 to 10 inches, and 5 percent 10 to 24 inches in size); very strongly acid; gradual boundary.

2Bt2—51 to 75 inches; yellowish red (5YR 5/6) extremely cherty silty clay; weak fine subangular blocky structure; hard, very firm; common distinct clay films on faces of peds; about 70 percent chert fragments (50 percent less than 3 inches, 10 percent 3 to 10 inches, and 10 percent 10 to 24 inches in size); strongly acid.

Rock fragments make up 35 to 70 percent of the profile. A typical distribution is about 1 percent stones, 15 percent cobbles, and 35 percent gravel. The rock fragments are chert and some sandstone.

The A horizon has value of 3 or 4 and chroma of 2 or 3. The E horizon has value of 5 or 6 and chroma of 3 or 4. The Bt horizon has hue of 10YR to 5YR and value and chroma of 4 to 6. The Bx horizon has hue of 10YR or 7.5YR, value of 5 or 6, and chroma of 4 to 8. The fine-earth fraction of this horizon is silt loam or silty clay loam. The 2Bt horizon has hue of 7.5YR to 10R, value of 3 to 6, and chroma of 3 to 8. The fine-earth fraction of this horizon is silty clay or clay.

Formation of the Soils

Soil forms through the interaction of climate, relief, and living organisms acting over time on parent material. The nature of a soil is determined by the composition of the parent material, the effects of living organisms, the climate under which the soil formed, the topography and landscape position, and the length of time that the forces of soil formation have been active.

Parent Material

The accumulation of material is the first step in the formation of a soil. The nature of the material is a most important factor in determining the kind of soil that forms. It influences texture, color, mineralogy, fertility, and many other properties of the soil. The soils in Iron County formed in material weathered from rhyolite, granite, carbonate rocks, and sandstone and in various old sediments, loess, colluvium, and alluvium.

Rocks of volcanic and plutonic origin have contributed to soil formation in the St. Francois Mountains. Most of the material has not weathered directly from hard rock. Irondale and Taumsauk soils are in areas of the thin regolith on the mountains, where 35 percent or more of the soil matrix consists of angular rhyolitic gravel, cobbles, stones, and boulders that are only partially decomposed. The rock interiors appear fresh and are slightly weathered at the surface. The presence of only slightly weathered rhyolite and the massive underlying formation indicate a youthful age or the unweatherability of rhyolite, or both.

Some soils are underlain by carbonate rocks. Bonne Terre dolomite underlies Crider, Fourche, Gasconade, Gatewood, and Lowell soils. A recent study of the geomorphic surfaces and surficial material in Belleview Valley shows that a large part of the parent material is not weathered from the bedrock *(12)*. In most areas only about 1 foot of soil can be attributed to weathering from bedrock. The overburden consists of loamy or clayey sediments.

Soils that have a deep regolith, such as Clarksville and Goss soils, are underlain by cherty dolomite at a considerable depth. The cherty red clay sediments are 10 to more than 50 feet thick. Goss soils formed in areas where these sediments crop out on steep side slopes. Cherty and loamy material overlies the cherty red clay in some areas. The content of chert in this material ranges from about 35 to more than 75 percent, by volume. Clarksville soils formed in this material.

Lamotte soils formed in loamy material weathered from sandstone of the Lamotte Formation. This is an extensive formation, but the areas where it crops out in Iron County are very limited. It represents a primeval beach or coastal foreland of coarse sand. The basal boulder beds and crossbedding require violent sheetflow or high-velocity currents generated by storms, tsunamis, floods, tides, or turbidity currents.

Some of the sediments on uplands occur as unconsolidated material transported and deposited by water. These sediments predate recognizable flood plain, terrace, or bench deposits. They are deposited in the Belleview Valley and other basins. Fourche, Gatewood, and Lowell soils formed partly in these sediments.

Several soils in the county formed in loess or loesslike silt. Loess commonly occurs as an overburden 20 to 30 inches thick in areas of Courtois, Crider, Delassus, Fourche, Knobtop, and Lebanon soils. The loess is less than 20 inches thick in areas of Auxvasse, Gatewood, Loughboro, Lowell, and Viburnum soils. The loess in the Ozarks is different from the deep Peorian loess on the hills along the Mississippi River. The deep loess deposits derived from glacial outwash are high in montmorillonite. The dominant clay mineralogy of the loess in Iron County is interlayered vermiculite *(1)*. The source of this loess remains uncertain.

Killarney soils formed partly in colluvial material that moved downslope to the foot slopes of the mountains. The material consists of fine earth, gravel, cobbles, stones, and boulders of rhyolite and other igneous rocks. These angular and rounded fragments are probably pyroclastics.

Auxvasse, Bloomsdale, Midco, Secesh, and Wakeland soils formed in the alluvial deposits on flood plains and terraces in the stream valleys. Basal

deposits of cobbles, pebbles, and sand indicate a high velocity of early streams. Gravelly deposits, which are prevalent in Midco soils, indicate that steep stream gradients and rapid runoff are still characteristic of most streams in the county. Rapid runoff and flash flooding are common on the headwaters of all the streams, especially those from mountainous areas. The texture of the silty surface layer in the Auxvasse, Secesh, and Wakeland soils probably results from the influence of loess.

Living Organisms

Plant and animal life in and on the soil has helped to change the parent material and has influenced the character of the soils in the county. The early Russian concept of soil genesis greatly emphasized the interactions between parent material and living organisms *(22)*.

Plants add organic matter and nitrogen to the soil. In the early stages of soil formation, gains in organic matter are probably greater than losses. After the early stages, however, there is a relatively rapid turnover of organic matter in most soils. Organic matter losses in Gasconade soils are slower than those in other soils because of the shallowness to bedrock and the dominance of grass vegetation during the genetic history of the soils. On only 2.5 percent of the acreage in the county, the soils formed under native grasses. The thick, dark surface layer of Dameron, Gasconade, and Taumsauk soils is characteristic of native grasslands. Small isolated areas of shallow soils that support prairie grasses are included with the Gatewood, Irondale, and Knobtop soils in mapping.

Climate

Climate has a definite and lasting impact on soils. Presently, Iron County has a humid continental climate marked by distinct seasonal changes and a predictable distribution of rainfall. This pattern has been generally stable for the brief period of climatic and historical records. Temperature variations caused by differences in elevation have had only a slight influence on the soils. Aspect affects soil temperature, which has had a measurable effect on soil formation. The Clarksville, Goss, Irondale, and Wilderness soils on the warmer south-facing slopes have thinner horizons, less available water, lower base saturation, and more acid conditions than the same soils on the cooler north-facing slopes. Precipitation has been adequate to leach some bases, lower the level of fertility, and translocate silicate clays in the soils on uplands.

Two events of the ancient past influenced the genesis of parent material or early soil development, or both. The first event was a lowering of the worldwide temperature, signaling the beginning of the Ice Age. The second event was a climatic change at the end of the late Pleistocene. During the Ice Age, much of the parent material on this continent accumulated and was deposited. Some of the pedisediments in the Ozarks are probably products of this period.

The late Pleistocene was a period of warming temperatures and aridity *(10, 11)*. The major loess deposition occurred during this period. Essentially all of the parent material in the county was deposited by the end of this period, except for the material along streams, which is still being deposited. By the end of the loess deposition, an active era of the accumulation of parent material closed.

Topography

Topography is the general form and shape of a land surface, including its relief. It is related to the natural landforms and the geologic erosion that dissects them. The landforms differ, depending on their genesis. The St. Francois Mountains have a very irregular topography characterized by long, steep slopes and high relief. The Salem Plateau is a sedimentary plain dissected by entrenched streams and massive geologic erosion. The downcutting and erosion of stream channels and drainageways have significantly altered this plain *(18)*. Relief on the plateau is moderate, and stream dissection has resulted in steep and relatively short slopes.

The basinlike valleys have low relief and mostly moderate and gentle slopes. These intermountain basins have a rolling topography. They are part of a larger or regional base level *(8, 9, 19)*. They are on a plain that includes the Summit platform of eastern Washington County, the Farmington Plain of St. Francois and Ste. Genevieve Counties, and the Fredericktown basin of Madison County. The long, narrow stream valleys are the youngest landforms in the county. They consist of foot slopes, terraces, and flood plains. They commonly have short, gentle slopes of low relief.

Topography affects soil formation through its effect on drainage, exposure of the parent material to weathering, and other factors. Downcutting may expose different kinds of parent material. For example, Goss and Clarksville soils formed in material exposed on steep side slopes resulting from the massive

downcutting and erosion that carved out valleys and drainage basins.

Landscape position affects the expression of weathering. Soils on level or gentle slopes commonly have distinct layers and a solum that is thicker than that in soils on steeper slopes. Less water runs off the surface of the less sloping soils, and more of the rainfall percolates through the profile. These positions are stable and protected against erosion. In contrast, soils on steep slopes are characterized by rapid runoff, little infiltration and percolation, and more erosion. In places they have indistinct horizons and a thin solum.

Topography influences drainage and, to a lesser extent, exposure to weathering. Drainage is related to the kind of parent material, the slope, the landscape position, and the water table. Well drained soils are commonly on high, convex slopes and have a very deep water table. Poorly drained soils commonly are on nearly level, low, concave slopes and have a high water table. Topography affects weathering through its effect on temperature and on exposure to sunlight and the wind. South and west aspects tend to be warmer and drier than north and east aspects.

Time

Time is an important factor of soil formation because it allows all the other factors to modify the parent material. The active forces of weathering and living organisms begin to modify the material as soon as it is deposited. Soil age is inferred from the degree to which the material has been modified. When the age of a soil is ascertained, the landform, the landscape position, and the slope should be taken into consideration. A soil cannot be older than the surface on which it lies.

Some events that occur early in the process of soil formation include the addition of organic material to the soil, the leaching of bases and an increase in acidity, the formation of a stable blocky structure in the subsoil, and the destruction of thin bedding planes in alluvium. Additions of organic matter can occur quite rapidly. A significant amount of organic matter has been added to the Udipsamments in Iron County in only a few decades. The length of time necessary for the leaching of bases varies, depending on the concentration of bases in the original parent material and the intensity of weathering. Irondale and Taumsauk soils formed in material weathered from acid igneous rocks and were inherently low in content of bases. The leaching of bases in alluvial soils, such as Dameron, Bloomsdale, and Midco soils, may be offset by the effects of frequent flooding.

The characteristics that indicate the age of the soils in Iron County include argillic horizons, fragipans, claypans, and low base saturation. An argillic horizon is an illuvial layer in which silicate clay movement has significantly increased the content of clay and resulted in the formation of clay films. This process requires time. The amount of time needed depends on the impact of climate and other factors. Argillic horizons formed in the sandy soils of Finland in only about 500 years *(6)*. If the amount of rainfall is consistently low, much time is required. Some soils may have undergone their most rapid weathering during earlier periods when the climate was warmer and more humid.

Fragipans are soil layers that imply some age. The formation of silicate clay bridges, the close packing of soil particles *(23)*, the formation of a dense, brittle zone *(15)*, the weathering of illite clay to vermiculite *(21)*, and the development of very acid conditions in the fragipan *(23)* all require time. Silicate clay can move downward in the soil profile rather rapidly if weathering is intense and the amount of rainfall is high.

Auxvasse and Loughboro are examples of soils that have a claypan, which probably formed during the normal illuviation common to all argillic horizons. The clayey subsoil in Auxvasse soils, however, is thought to be depositional in origin and not the result of weathering *(5)*. Limited mineralogical and mechanical data for the Loughboro soils suggest the same possibility. The weathering that has occurred has been affected by gentle slopes and low relief. Both soils are in small isolated areas that may be remnants of formerly extensive landforms.

Low base saturation and the accompanying acid reaction can indicate the age of a soil. Knobtop, Irondale, Taumsauk, Killarney, Syenite, and Delassus soils are Ultisols, which are considered to be of advanced age. The parent material, however, is derived mainly from acid igneous rocks that have inherently low base saturation. It is logical to assume that these soils have always had low base saturation.

The thick solum in Clarksville, Courtois, Crider, Fourche, Goss, and Lamotte soils is not necessarily the result of a great length of time. It could be the result of the initial accumulation of a thick regolith.

Geomorphology and Landforms

Soils and their pattern of occurrence on the landscape are very closely related to landforms, such as plains, mountains, hills, and valleys. Soils are similar, if not the same, where the environmental factors are similar. Landforms provide a setting where many of these factors are constant or uniform. Therefore, certain features, such as local relief, geology, surficial material, and the impact of climate, should be similar on similar landforms in a given area. Time is a constant factor since the initial structure is assumed to have originated as a single event. Events and forces, such as erosion, may change the original landform to the extent that in some areas only a remnant of the old remains and new forms are dominant. Most landforms are nothing more than the remnants of ancient landforms *(25)*. The very essence of geomorphology is distinguishing between the ancient and the modern *(7)*. This concept can be easily demonstrated in Iron County.

The county has a diversity of landforms. The four major landforms are the St. Francois Mountains, the Salem Plateau, the intermountain basins, and the stream valleys.

The St. Francois Mountains consist of a group of peaks clustered in the central part of the county. Most of these reach an elevation of 1,500 to 1,772 feet. These ancient landforms are preserved today almost unaltered from their original form *(4)*. They are made up chiefly of rhyolitic lava flows or felsites extruded from volcanic vents and cracks. A small amount of red granite is included near the northeast corner of the county. Also, tuff is deposited in small areas, primarily in the vicinity of Ketcherside Mountain. Numerous diabase intrusions have been mapped, but their acreage is very minor *(24)*. The only evidence of wash from the mountain peaks is talus slopes in areas of Killarney soils and narrow flood plains in areas of Bloomsdale soils. Other soils mapped in the mountains are the Delassus, Irondale, Knobtop, Syenite, and Taumsauk soils. All of these soils formed partly or entirely in a thin layer of material weathered from igneous rocks. A distinct notch marks the boundary between the mountains and the Salem Plateau.

The Salem Plateau is an extensive landform surrounding the St. Francois Mountains. It is dissected by numerous streams. Narrow ridgetops are remnants of the smooth, gently sloping surface of the original plateau. Elevations are commonly 1,100 to 1,200 feet but are as high as 1,400 feet or more because of faulting, warping, and uplift. This extensive region of sedimentary origin is bounded on its eastern edge by the Avon and Crystal escarpments. A similarly defined boundary between the Salem Plateau and Belleview Valley is essentially an extension of the Avon escarpment, which defines the bounds of the intermountain basins. Lebanon and Viburnum soils are on the ridgetops and divides. They formed in a thin layer of loess and in the underlying cherty sediments and residuum. Clarksville and Goss formed in cherty material on the steep dissected side slopes.

The intermountain basins or coves are depressions between or bordering the mountain peaks. Arcadia Valley, Belleview Valley, Buford Bottom, and Flatwood Valley are the major basins in the county. They are inset into the Paleozoic sedimentary rocks of the Salem Plateau. These valleys are part of or an extension of the Farmington Plain. They are gently rolling and rolling and have an altitude of 900 to 1,100 feet. Each of these basins is more or less isolated from other basins or valleys by narrows or shut-ins (fig. 15).

Three geomorphic surfaces have been identified in the Belleview and Flatwood Valleys *(12)*. The highest and oldest surface occurs only as a remnant. The sediment in which the soils on this surface formed is reddish, clayey material that has a thin silty overburden marked by a lag line of rounded chert cobbles and gravel. Courtois soils formed in this material. The second surface is on ridgetops. Crider, Fourche, and Lowell soils are on these ridgetops. They formed in a thin layer of loess and in the underlying clayey sediments. The third surface is on side slopes. Gatewood soils are on this surface. They formed in clayey sediments over dolomite.

The stream valleys differ from the basins in size, shape, and origin. They are long, narrow entrenchments

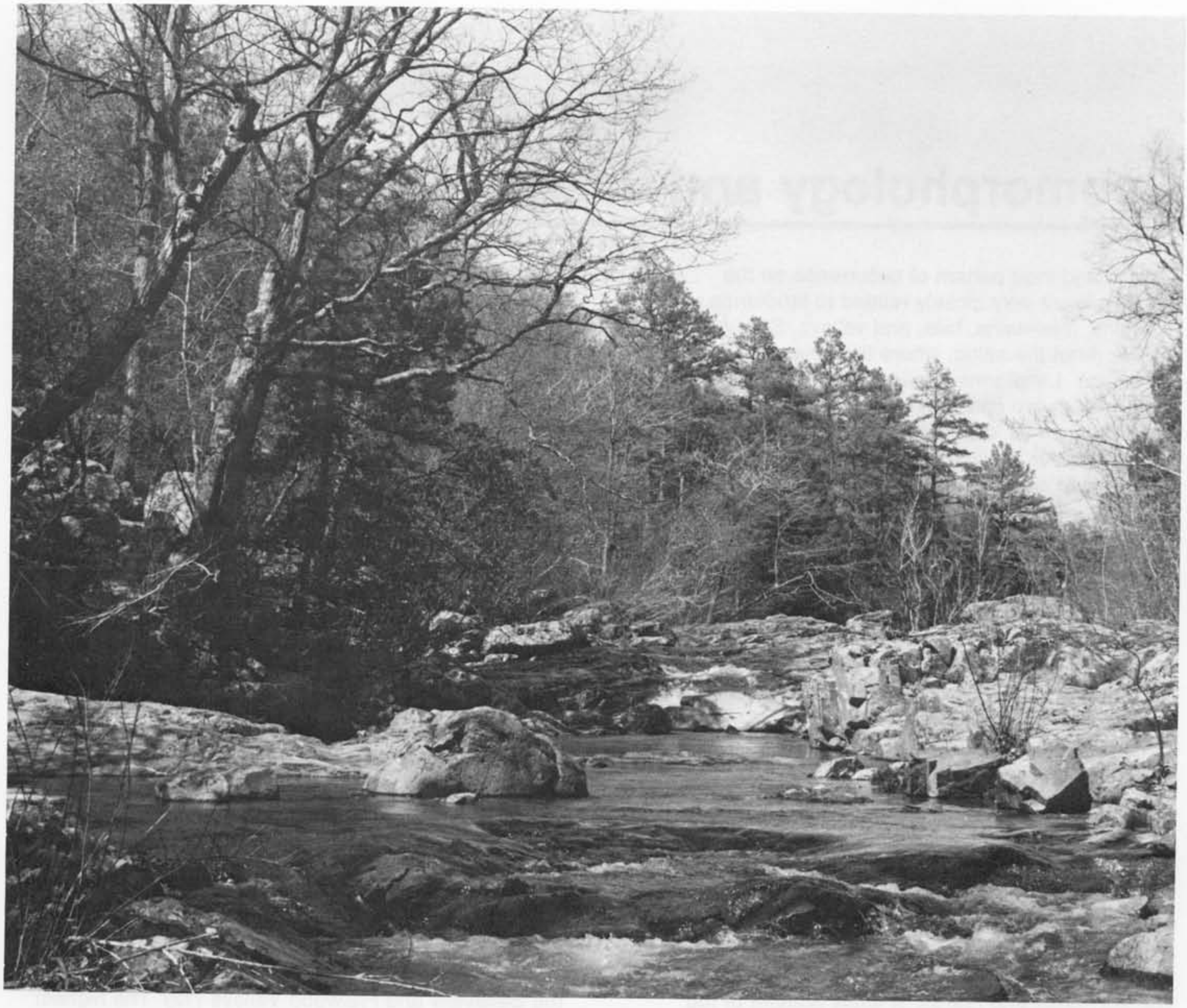

Figure 15.—A shut-in along a stream in Iron County.

that have been eroded and dissected by streams. They consist of a network of creeks, branches, and hollows that extend to all parts of the county and dissect the landscape, especially the Salem Plateau. The upper reaches of the small valleys commonly are at an elevation of 1,000 to 1,100 feet, whereas the lower stream valleys, such as those along Big Creek and Crane Pond Creek, are at an elevation of 500 to 600 feet. These valleys consist of narrow flood plains, small remnants of terraces, or second bottoms and narrow foot slopes. They are bounded on either side by comparatively steep upland side slopes. The valley bottoms are filled with gravelly and loamy alluvium washed from the uplands. They have exclusively gravelly material in the upper reaches. This material occurs as continuous beds in downstream areas and

underlies other alluvium as basal deposits. The only interruption of this pattern is in the shut-ins, most of which have no soil cover.

Dameron, Midco, and Wakeland soils are on the nearly level flood plains. Auxvasse and Secesh soils are on the terraces. Viraton soils are on the foot slopes and alluvial fans.

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Glossary

Aeration, soil. The exchange of air in soil with air from the atmosphere. The air in a well aerated soil is similar to that in the atmosphere; the air in a poorly aerated soil is considerably higher in carbon dioxide and lower in oxygen.

Aggregate, soil. Many fine particles held in a single mass or cluster. Natural soil aggregates, such as granules, blocks, or prisms, are called peds. Clods are aggregates produced by tillage or logging.

Alluvium. Material, such as sand, silt, or clay, deposited on land by streams.

Area reclaim (in tables). An area difficult to reclaim after the removal of soil for construction and other uses. Revegetation and erosion control are extremely difficult.

Association, soil. A group of soils geographically associated in a characteristic repeating pattern and defined and delineated as a single map unit.

Available water capacity (available moisture capacity). The capacity of soils to hold water available for use by most plants. It is commonly defined as the difference between the amount of soil water at field moisture capacity and the amount at wilting point. It is commonly expressed as inches of water per inch of soil. The capacity, in inches, in a 60-inch profile or to a limiting layer is expressed as—

Very low	0 to 3
Low	3 to 6
Moderate	6 to 9
High	9 to 12
Very high	more than 12

Base saturation. The degree to which material having cation-exchange properties is saturated with exchangeable bases (sum of Ca, Mg, Na, K), expressed as a percentage of the total cation-exchange capacity.

Bedding planes. Fine stratifications, less than 5 millimeters thick, in unconsolidated alluvial, eolian, lacustrine, or marine sediments.

Bedrock. The solid rock that underlies the soil and other unconsolidated material or that is exposed at the surface.

Bench terrace. A raised, level or nearly level strip of earth constructed on or nearly on the contour, supported by a barrier of rocks or similar material, and designed to make the soil suitable for tillage and to prevent accelerated erosion.

Bottom land. The normal flood plain of a stream, subject to flooding.

Boulders. Rock fragments larger than 2 feet (60 centimeters) in diameter.

Cation-exchange capacity. The total amount of exchangeable cations that can be held by the soil, expressed in terms of milliequivalents per 100 grams of soil at neutrality (pH 7.0) or at some other stated pH value. The term, as applied to soils, is synonymous with base-exchange capacity but is more precise in meaning.

Clay. As a soil separate, the mineral soil particles less than 0.002 millimeter in diameter. As a soil textural class, soil material that is 40 percent or more clay, less than 45 percent sand, and less than 40 percent silt.

Clay film. A thin coating of oriented clay on the surface of a soil aggregate or lining pores or root channels. Synonyms: clay coating, clay skin.

Claypan. A slowly permeable soil horizon that contains much more clay than the horizons above it. A claypan is commonly hard when dry and plastic or stiff when wet.

Cobblestone (or cobble). A rounded or partly rounded fragment of rock 3 to 10 inches (7.5 to 25 centimeters) in diameter.

Colluvium. Soil material, rock fragments, or both moved by creep, slide, or local wash and deposited at the base of steep slopes.

Complex slope. Irregular or variable slope. Planning or constructing terraces, diversions, and other water-control measures on a complex slope is difficult.

Complex, soil. A map unit of two or more kinds of soil in such an intricate pattern or so small in area that

it is not practical to map them separately at the selected scale of mapping. The pattern and proportion of the soils are somewhat similar in all areas.

Concretions. Grains, pellets, or nodules of various sizes, shapes, and colors consisting of concentrated compounds or cemented soil grains. The composition of most concretions is unlike that of the surrounding soil. Calcium carbonate and iron oxide are common compounds in concretions.

Consistence, soil. The feel of the soil and the ease with which a lump can be crushed by the fingers. Terms commonly used to describe consistence are—

Loose.—Noncoherent when dry or moist; does not hold together in a mass.

Friable.—When moist, crushes easily under gentle pressure between thumb and forefinger and can be pressed together into a lump.

Firm.—When moist, crushes under moderate pressure between thumb and forefinger, but resistance is distinctly noticeable.

Plastic.—When wet, readily deformed by moderate pressure but can be pressed into a lump; will form a "wire" when rolled between thumb and forefinger.

Sticky.—When wet, adheres to other material and tends to stretch somewhat and pull apart rather than to pull free from other material.

Hard.—When dry, moderately resistant to pressure; can be broken with difficulty between thumb and forefinger.

Soft.—When dry, breaks into powder or individual grains under very slight pressure.

Cemented.—Hard; little affected by moistening.

Control section. The part of the soil on which classification is based. The thickness varies among different kinds of soil, but for many it is that part of the soil profile between depths of 10 inches and 40 or 80 inches.

Corrosive. High risk of corrosion to uncoated steel or deterioration of concrete.

Cover crop. A close-growing crop grown primarily to improve and protect the soil between periods of regular crop production, or a crop grown between trees and vines in orchards and vineyards.

Cutbanks cave (in tables). The walls of excavations tend to cave in or slough.

Deferred grazing. Postponing grazing or resting grazing land for a prescribed period.

Depth to rock (in tables). Bedrock is too near the surface for the specified use.

Diversion (or diversion terrace). A ridge of earth, generally a terrace, built to protect downslope areas by diverting runoff from its natural course.

Drainage class (natural). Refers to the frequency and duration of periods of saturation or partial saturation during soil formation, as opposed to altered drainage, which is commonly the result of artificial drainage or irrigation but may be caused by the sudden deepening of channels or the blocking of drainage outlets. Seven classes of natural soil drainage are recognized:

Excessively drained.—Water is removed from the soil very rapidly. Excessively drained soils are commonly very coarse textured, rocky, or shallow. Some are steep. All are free of the mottling related to wetness.

Somewhat excessively drained.—Water is removed from the soil rapidly. Many somewhat excessively drained soils are sandy and rapidly pervious. Some are shallow. Some are so steep that much of the water they receive is lost as runoff. All are free of the mottling related to wetness.

Well drained.—Water is removed from the soil readily, but not rapidly. It is available to plants throughout most of the growing season, and wetness does not inhibit growth of roots for significant periods during most growing seasons. Well drained soils are commonly medium textured. They are mainly free of mottling.

Moderately well drained.—Water is removed from the soil somewhat slowly during some periods. Moderately well drained soils are wet for only a short time during the growing season, but periodically they are wet long enough that most mesophytic crops are affected. They commonly have a slowly pervious layer within or directly below the solum, or periodically receive high rainfall, or both.

Somewhat poorly drained.—Water is removed slowly enough that the soil is wet for significant periods during the growing season. Wetness markedly restricts the growth of mesophytic crops unless artificial drainage is provided. Somewhat poorly drained soils commonly have a slowly pervious layer, a high water table, additional water from seepage, nearly continuous rainfall, or a combination of these.

Poorly drained.—Water is removed so slowly that the soil is saturated periodically during the growing season or remains wet for long periods. Free water is commonly at or near the surface for long enough during the growing season that most

mesophytic crops cannot be grown unless the soil is artificially drained. The soil is not continuously saturated in layers directly below plow depth. Poor drainage results from a high water table, a slowly pervious layer within the profile, seepage, nearly continuous rainfall, or a combination of these.

Very poorly drained.—Water is removed from the soil so slowly that free water remains at or on the surface during most of the growing season. Unless the soil is artificially drained, most mesophytic crops cannot be grown. Very poorly drained soils are commonly level or depressed and are frequently ponded. Yet, where rainfall is high and nearly continuous, they can have moderate or high slope gradients.

Drainage, surface. Runoff, or surface flow of water, from an area.

Eluviation. The movement of material in true solution or colloidal suspension from one place to another within the soil. Soil horizons that have lost material through eluviation are eluvial; those that have received material are illuvial.

Eolian soil material. Earthy parent material accumulated through wind action; commonly refers to sandy material in dunes or to loess in blankets on the surface.

Erosion. The wearing away of the land surface by water, wind, ice, or other geologic agents and by such processes as gravitational creep.

Erosion (geologic). Erosion caused by geologic processes acting over long geologic periods and resulting in the wearing away of mountains and the building up of such landscape features as flood plains and coastal plains. Synonym: natural erosion.

Erosion (accelerated). Erosion much more rapid than geologic erosion, mainly as a result of the activities of man or other animals or of a catastrophe in nature, for example, fire, that exposes the surface.

Erosion pavement. A layer of gravel or stones that remains on the surface after fine particles are removed by sheet or rill erosion.

Excess fines (in tables). Excess silt and clay in the soil. The soil is not a source of gravel or sand for construction purposes.

Field moisture capacity. The moisture content of a soil, expressed as a percentage of the ovendry weight, after the gravitational, or free, water has drained away; the field moisture content 2 or 3 days after a soaking rain; also called *normal field capacity, normal moisture capacity,* or *capillary capacity.*

Fine textured soil. Sandy clay, silty clay, and clay.

First bottom. The normal flood plain of a stream, subject to frequent or occasional flooding.

Flagstone. A thin fragment of sandstone, limestone, slate, shale, or (rarely) schist, 6 to 15 inches (15 to 38 centimeters) long.

Flood plain. A nearly level alluvial plain that borders a stream and is subject to flooding unless protected artificially.

Foot slope. The inclined surface at the base of a hill.

Forb. Any herbaceous plant not a grass or a sedge.

Fragipan. A loamy, brittle subsurface horizon low in porosity and content of organic matter and low or moderate in clay but high in silt or very fine sand. A fragipan appears cemented and restricts roots. When dry, it is hard or very hard and has a higher bulk density than the horizon or horizons above. When moist, it tends to rupture suddenly under pressure rather than to deform slowly.

Frost action (in tables). Freezing and thawing of soil moisture. Frost action can damage roads, buildings and other structures, and plant roots.

Genesis, soil. The mode of origin of the soil. Refers especially to the processes or soil-forming factors responsible for the formation of the solum, or true soil, from the unconsolidated parent material.

Grassed waterway. A natural or constructed waterway, typically broad and shallow, seeded to grass as protection against erosion. Conducts surface water away from cropland.

Gravel. Rounded or angular fragments of rock as much as 3 inches (2 millimeters to 7.6 centimeters) in diameter. An individual piece is a pebble.

Gravelly soil material. Material that is 15 to 50 percent, by volume, rounded or angular rock fragments, not prominently flattened, as much as 3 inches (7.6 centimeters) in diameter.

Green manure crop (agronomy). A soil-improving crop grown to be plowed under in an early stage of maturity or soon after maturity.

Ground water (geology). Water filling all the unblocked pores of underlying material below the water table.

Gully. A miniature valley with steep sides cut by running water and through which water ordinarily runs only after rainfall. The distinction between a gully and a rill is one of depth. A gully generally is an obstacle to farm machinery and is too deep to be obliterated by ordinary tillage; a rill is of lesser depth and can be smoothed over by ordinary tillage.

Horizon, soil. A layer of soil, approximately parallel to the surface, having distinct characteristics

produced by soil-forming processes. In the identification of soil horizons, an uppercase letter represents the major horizons. Numbers or lowercase letters that follow represent subdivisions of the major horizons. The major horizons are as follows:

O horizon.—An organic layer of fresh and decaying plant residue.

A horizon.—The mineral horizon at or near the surface in which an accumulation of humified organic matter is mixed with the mineral material. Also, any plowed or disturbed surface layer.

E horizon.—The mineral horizon in which the main feature is loss of silicate clay, iron, aluminum, or some combination of these.

B horizon.—The mineral horizon below an O, A, or E horizon. The B horizon is in part a layer of transition from the overlying horizon to the underlying C horizon. The B horizon also has distinctive characteristics, such as (1) accumulation of clay, sesquioxides, humus, or a combination of these; (2) granular, prismatic, or blocky structure; (3) redder or browner colors than those in the A horizon; or (4) a combination of these.

C horizon.—The mineral horizon or layer, excluding indurated bedrock, that is little affected by soil-forming processes and does not have the properties typical of the overlying horizon. The material of a C horizon may be either like or unlike that in which the solum formed. If the material is known to differ from that in the solum, an Arabic numeral, commonly a 2, precedes the letter C.

Cr horizon.—Soft, consolidated bedrock beneath the soil.

R layer.—Hard, consolidated bedrock beneath the soil. The bedrock commonly underlies a C horizon but can be directly below an A or a B horizon.

Humus. The well decomposed, more or less stable part of the organic matter in mineral soils.

Hydrologic soil groups. Refers to soils grouped according to their runoff-producing characteristics. The chief consideration is the inherent capacity of soil bare of vegetation to permit infiltration. The slope and the kind of plant cover are not considered but are separate factors in predicting runoff. Soils are assigned to four groups. In group A are soils having a high infiltration rate when thoroughly wet and having a low runoff potential. They are mainly deep, well drained, and sandy or gravelly. In group D, at the other extreme, are soils having a very slow infiltration rate and thus a high runoff potential. They have a claypan or clay layer at or near the surface, have a permanent high water table, or are shallow over nearly impervious bedrock or other material. A soil is assigned to two hydrologic groups if part of the acreage is artificially drained and part is undrained.

Illuviation. The movement of soil material from one horizon to another in the soil profile. Generally, material is removed from an upper horizon and deposited in a lower horizon.

Impervious soil. A soil through which water, air, or roots penetrate slowly or not at all. No soil is absolutely impervious to air and water all the time.

Infiltration. The downward entry of water into the immediate surface of soil or other material, as contrasted with percolation, which is movement of water through soil layers or material.

Infiltration rate. The rate at which water penetrates the surface of the soil at any given instant, usually expressed in inches per hour. The rate can be limited by the infiltration capacity of the soil or the rate at which water is applied at the surface.

Lacustrine deposit (geology). Material deposited in lake water and exposed when the water level is lowered or the elevation of the land is raised.

Landform. Any recognizable physical feature of the earth's surface having a characteristic shape and produced by natural causes. Examples are mountains, plateaus, plains, valleys, flood plains, and terraces. Together, the landforms make up the surface configuration of the earth.

Landslide. The rapid downhill movement of a mass of soil and loose rock, generally when wet or saturated. The speed and distance of movement, as well as the amount of soil and rock material, vary greatly.

Large stones (in tables). Rock fragments 3 inches (7.6 centimeters) or more across. Large stones adversely affect the specified use of the soil.

Leaching. The removal of soluble material from soil or other material by percolating water.

Liquid limit. The moisture content at which the soil passes from a plastic to a liquid state.

Loam. Soil material that is 7 to 27 percent clay particles, 28 to 50 percent silt particles, and less than 52 percent sand particles.

Loess. Fine grained material, dominantly of silt-sized particles, deposited by wind.

Low strength. The soil is not strong enough to support loads.

Medium textured soil. Very fine sandy loam, loam, silt loam, or silt.

Metamorphic rock. Rock of any origin altered in mineralogical composition, chemical composition, or structure by heat, pressure, and movement. Nearly all such rocks are crystalline.

Mineral soil. Soil that is mainly mineral material and low in organic material. Its bulk density is more than that of organic soil.

Minimum tillage. Only the tillage essential to crop production and prevention of soil damage.

Miscellaneous area. An area that has little or no natural soil and supports little or no vegetation.

Morphology, soil. The physical makeup of the soil, including the texture, structure, porosity, consistence, color, and other physical, mineral, and biological properties of the various horizons, and the thickness and arrangement of those horizons in the soil profile.

Mottling, soil. Irregular spots of different colors that vary in number and size. Mottling generally indicates poor aeration and impeded drainage. Descriptive terms are as follows: abundance—*few, common,* and *many*; size—*fine, medium,* and *coarse*; and contrast—*faint, distinct,* and *prominent.* The size measurements are of the diameter along the greatest dimension. *Fine* indicates less than 5 millimeters (about 0.2 inch); *medium,* from 5 to 15 millimeters (about 0.2 to 0.6 inch); and *coarse,* more than 15 millimeters (about 0.6 inch).

Munsell notation. A designation of color by degrees of three simple variables—hue, value, and chroma. For example, a notation of 10YR 6/4 is a color of 10YR hue, value of 6, and chroma of 4.

Neutral soil. A soil having a pH value between 6.6 and 7.3. (See Reaction, soil.)

Nutrient, plant. Any element taken in by a plant essential to its growth. Plant nutrients are mainly nitrogen, phosphorus, potassium, calcium, magnesium, sulfur, iron, manganese, copper, boron, and zinc obtained from the soil and carbon, hydrogen, and oxygen obtained from the air and water.

Organic matter. Plant and animal residue in the soil in various stages of decomposition.

Parent material. The unconsolidated organic and mineral material in which soil forms.

Ped. An individual natural soil aggregate, such as a granule, a prism, or a block.

Pedon. The smallest volume that can be called "a soil." A pedon is three dimensional and large enough to permit study of all horizons. Its area ranges from about 10 to 100 square feet (1 square meter to 10 square meters), depending on the variability of the soil.

Percolation. The downward movement of water through the soil.

Percs slowly (in tables). The slow movement of water through the soil, adversely affecting the specified use.

Permeability. The quality of the soil that enables water to move downward through the profile. Permeability is measured as the number of inches per hour that water moves downward through the saturated soil. Terms describing permeability are:

Very slow	less than 0.06 inch
Slow	0.06 to 0.2 inch
Moderately slow	0.2 to 0.6 inch
Moderate	0.6 inch to 2.0 inches
Moderately rapid	2.0 to 6.0 inches
Rapid	6.0 to 20 inches
Very rapid	more than 20 inches

Phase, soil. A subdivision of a soil series based on features that affect its use and management. For example, slope, stoniness, and thickness.

pH value. A numerical designation of acidity and alkalinity in soil. (See Reaction, soil.)

Piping (in tables). Formation of subsurface tunnels or pipelike cavities by water moving through the soil.

Plasticity index. The numerical difference between the liquid limit and the plastic limit; the range in moisture content within which the soil remains plastic.

Plastic limit. The moisture content at which a soil changes from semisolid to plastic.

Plowpan. A compacted layer formed in the soil directly below the plowed layer.

Plutonic rocks. Rocks formed at considerable depth by crystallization (slow cooling) of magma or by chemical alteration. They are characteristically medium or coarse grained or of granitoid texture.

Ponding. Standing water on soils in closed depressions. Unless the soils are artificially drained, the water can be removed only by percolation or evapotranspiration.

Productivity, soil. The capability of a soil for producing a specified plant or sequence of plants under specific management.

Profile, soil. A vertical section of the soil extending through all its horizons and into the parent material.

Pyroclastic. Formed by the fragmentation caused by volcanic explosion or aerial expulsion from a volcanic vent.

Reaction, soil. A measure of acidity or alkalinity of a soil, expressed in pH values. A soil that tests to pH 7.0 is described as precisely neutral in reaction because it is neither acid nor alkaline. The degrees of acidity or alkalinity, expressed as pH values, are—

Extremely acid	below 4.5
Very strongly acid	4.5 to 5.0
Strongly acid	5.1 to 5.5
Medium acid	5.6 to 6.0
Slightly acid	6.1 to 6.5
Neutral	6.6 to 7.3
Mildly alkaline	7.4 to 7.8
Moderately alkaline	7.9 to 8.4
Strongly alkaline	8.5 to 9.0
Very strongly alkaline	9.1 and higher

Regolith. The unconsolidated mantle of weathered rock and soil material on the earth's surface; the loose earth material above the solid rock.

Relief. The elevations or inequalities of a land surface, considered collectively.

Residuum (residual soil material). Unconsolidated, weathered or partly weathered mineral material that accumulated as consolidated rock disintegrated in place.

Rhyolite. A group of extrusive igneous rocks exhibiting flow texture with phenocrysts of quartz and alkali feldspar in a glassy to cryptocrystalline groundmass. It is the extrusive equivalent of granite.

Rill. A steep-sided channel resulting from accelerated erosion. A rill is generally a few inches deep and not wide enough to be an obstacle to farm machinery.

Rippable. Bedrock or hardpan can be excavated using a single-tooth ripping attachment mounted on a tractor with a 200-300 draw bar horsepower rating.

Rock fragments. Rock or mineral fragments having a diameter of 2 millimeters or more; for example, pebbles, cobbles, stones, and boulders.

Rooting depth (in tables). Shallow root zone. The soil is shallow over a layer that greatly restricts roots.

Root zone. The part of the soil that can be penetrated by plant roots.

Runoff. The precipitation discharged into stream channels from an area. The water that flows off the surface of the land without sinking into the soil is called surface runoff. Water that enters the soil before reaching surface streams is called ground-water runoff or seepage flow from ground water.

Sand. As a soil separate, individual rock or mineral fragments from 0.05 millimeter to 2.0 millimeters in diameter. Most sand grains consist of quartz. As a soil textural class, a soil that is 85 percent or more sand and not more than 10 percent clay.

Sandstone. Sedimentary rock containing dominantly sand-sized particles.

Sedimentary rock. Rock made up of particles deposited from suspension in water. The chief kinds of sedimentary rock are conglomerate, formed from gravel; sandstone, formed from sand; shale, formed from clay; and limestone, formed from soft masses of calcium carbonate. There are many intermediate types. Some wind-deposited sand is consolidated into sandstone.

Seepage (in tables). The movement of water through the soil. Seepage adversely affects the specified use.

Series, soil. A group of soils that have profiles that are almost alike, except for differences in texture of the surface layer or of the substratum. All the soils of a series have horizons that are similar in composition, thickness, and arrangement.

Sheet erosion. The removal of a fairly uniform layer of soil material from the land surface by the action of rainfall and surface runoff.

Shrink-swell. The shrinking of soil when dry and the swelling when wet. Shrinking and swelling can damage roads, dams, building foundations, and other structures. It can also damage plant roots.

Silt. As a soil separate, individual mineral particles that range in diameter from the upper limit of clay (0.002 millimeter) to the lower limit of very fine sand (0.05 millimeter). As a soil textural class, soil that is 80 percent or more silt and less than 12 percent clay.

Similar soils. Soils that share limits of diagnostic criteria, behave and perform in a similar manner, and have similar conservation needs or management requirements for the major land uses in the survey area.

Site index. A designation of the quality of a forest site based on the height of the dominant stand at an arbitrarily chosen age. For example, if the average height attained by dominant and codominant trees in a fully stocked stand at the age of 50 years is 75 feet, the site index is 75 feet.

Slope. The inclination of the land surface from the horizontal. Percentage of slope is the vertical distance divided by horizontal distance, then multiplied by 100. Thus, a slope of 20 percent is a drop of 20 feet in 100 feet of horizontal distance.

Slope (in tables). Slope is great enough that special practices are required to ensure satisfactory performance of the soil for a specific use.

Small stones (in tables). Rock fragments less than 3 inches (7.6 centimeters) in diameter. Small stones adversely affect the specified use of the soil.

Soil. A natural, three-dimensional body at the earth's surface. It is capable of supporting plants and has properties resulting from the integrated effect of climate and living matter acting on earthy parent material, as conditioned by relief over periods of time.

Soil separates. Mineral particles less than 2 millimeters in equivalent diameter and ranging between specified size limits. The names and sizes, in millimeters, of separates recognized in the United States are as follows:

Very coarse sand	2.0 to 1.0
Coarse sand	1.0 to 0.5
Medium sand	0.5 to 0.25
Fine sand	0.25 to 0.10
Very fine sand	0.10 to 0.05
Silt	0.05 to 0.002
Clay	less than 0.002

Solum. The upper part of a soil profile, above the C horizon, in which the processes of soil formation are active. The solum in soil consists of the A, E, and B horizons. Generally, the characteristics of the material in these horizons are unlike those of the substratum. The living roots and plant and animal activities are largely confined to the solum.

Stone line. A concentration of coarse fragments in a soil. Generally, it is indicative of an old weathered surface. In a cross section, the line may be one fragment or more thick. It generally overlies material that weathered in place and is overlain by recent sediments of variable thickness.

Stones. Rock fragments 10 to 24 inches (25 to 60 centimeters) in diameter.

Stony. Refers to a soil containing stones in numbers that interfere with or prevent tillage.

Stripcropping. Growing crops in a systematic arrangement of strips or bands which provide vegetative barriers to soil blowing and water erosion.

Structure, soil. The arrangement of primary soil particles into compound particles or aggregates. The principal forms of soil structure are—*platy* (laminated), *prismatic* (vertical axis of aggregates longer than horizontal), *columnar* (prisms with rounded tops), *blocky* (angular or subangular), and *granular*. *Structureless* soils are either *single grain* (each grain by itself, as in dune sand) or *massive* (the particles adhering without any regular cleavage, as in many hardpans).

Subsoil. Technically, the B horizon; roughly, the part of the solum below plow depth.

Subsoiling. Breaking up a compact subsoil by pulling a special chisel through the soil.

Substratum. The part of the soil below the solum.

Subsurface layer. Any surface soil horizon (A, E, AB, or EB) below the surface layer.

Surface layer. The soil ordinarily moved in tillage, or its equivalent in uncultivated soil, ranging in depth from about 4 to 10 inches (10 to 25 centimeters). Frequently designated as the "plow layer," or the "Ap horizon."

Surface soil. The A, E, AB, and EB horizons. It includes all subdivisions of these horizons.

Taxadjuncts. Soils that cannot be classified in a series recognized in the classification system. Such soils are named for a series they strongly resemble and are designated as taxadjuncts to that series because they differ in ways too small to be of consequence in interpreting their use and behavior.

Terrace. An embankment, or ridge, constructed across sloping soils on the contour or at a slight angle to the contour. The terrace intercepts surface runoff so that water soaks into the soil or flows slowly to a prepared outlet.

Terrace (geologic). An old alluvial plain, ordinarily flat or undulating, bordering a river, a lake, or the sea.

Texture, soil. The relative proportions of sand, silt, and clay particles in a mass of soil. The basic textural classes, in order of increasing proportion of fine particles, are *sand, loamy sand, sandy loam, loam, silt loam, silt, sandy clay loam, clay loam, silty clay loam, sandy clay, silty clay,* and *clay*. The sand, loamy sand, and sandy loam classes may be further divided by specifying "coarse," "fine," or "very fine."

Thin layer (in tables). Otherwise suitable soil material too thin for the specified use.

Tilth, soil. The physical condition of the soil as related to tillage, seedbed preparation, seedling emergence, and root penetration.

Toe slope. The outermost inclined surface at the base of a hill; part of a foot slope.

Topsoil. The upper part of the soil, which is the most favorable material for plant growth. It is ordinarily rich in organic matter and is used to topdress roadbanks, lawns, and land affected by mining.

Tuff. A compacted deposit that is 50 percent or more volcanic ash and dust.

Upland (geology). Land at a higher elevation, in general, than the alluvial plain or stream terrace;

land above the lowlands along streams.

Variegation. Refers to patterns of contrasting colors assumed to be inherited from the parent material rather than to be the result of poor drainage.

Weathering. All physical and chemical changes produced in rocks or other deposits at or near the earth's surface by atmospheric agents. These changes result in disintegration and decomposition of the material.

Well graded. Refers to soil material consisting of coarse grained particles that are well distributed over a wide range in size or diameter. Such soil normally can be easily increased in density and bearing properties by compaction. Contrasts with poorly graded soil.

Wilting point (or permanent wilting point). The moisture content of soil, on an ovendry basis, at which a plant (specifically a sunflower) wilts so much that it does not recover when placed in a humid, dark chamber.

Tables

TABLE 1.--TEMPERATURE AND PRECIPITATION

(Recorded in the period 1951-84 at Arcadia, Missouri)

Month	Temperature						Precipitation				
	Average daily maximum	Average daily minimum	Average	2 years in 10 will have-- Maximum temperature higher than--	2 years in 10 will have-- Minimum temperature lower than--	Average number of growing degree days*	Average	2 years in 10 will have-- Less than--	2 years in 10 will have-- More than--	Average number of days with 0.10 inch or more	Average snowfall
	^{o}F	^{o}F	^{o}F	^{o}F	^{o}F	Units	In	In	In		In
January-----	42.5	21.1	31.8	71	3	10	2.34	0.84	3.57	5	3.4
February----	48.5	25.2	36.9	75	3	17	2.57	1.27	3.69	5	3.2
March-------	58.3	33.4	45.9	83	9	88	4.22	2.11	6.04	7	2.4
April-------	70.6	43.9	57.3	89	21	250	4.65	2.50	6.53	7	.4
May--------	78.3	51.6	65.0	91	30	465	4.61	2.57	6.40	7	.0
June-------	85.4	60.1	72.8	96	42	684	4.01	1.66	5.98	6	.0
July--------	90.0	64.2	77.1	100	47	840	3.81	1.59	5.68	5	.0
August------	88.5	62.5	75.5	100	46	791	3.80	1.75	5.56	5	.0
September---	81.5	54.9	68.2	95	35	546	3.67	1.40	5.56	5	.0
October-----	71.6	43.7	57.7	88	23	258	2.83	.88	4.42	5	.0
November----	57.4	34.0	45.7	78	10	37	4.13	1.72	6.17	6	1.3
December----	46.6	26.2	36.4	71	0	18	3.63	1.28	5.57	6	2.1
Yearly:											
Average---	68.3	43.3	55.9	---	---	---	---	---	---	---	---
Extreme---	---	---	---	101	0	---	---	---	---	---	---
Total-----	---	---	---	---	---	4,004	44.27	34.30	53.33	69	12.8

* A growing degree day is a unit of heat available for plant growth. It can be calculated by adding the maximum and minimum daily temperatures, dividing the sum by 2, and subtracting the temperature below which growth is mimimal for the principal crops in the area (50 degrees F).

TABLE 2.--FREEZE DATES IN SPRING AND FALL

(Recorded in the period 1951-84 at Arcadia, Missouri)

Probability	Temperature		
	24^{o} F or lower	28^{o} F or lower	32^{o} F or lower
Last freezing temperature in spring:			
1 year in 10 later than--	Apr. 14	Apr. 24	May 13
2 years in 10 later than--	Apr. 10	Apr. 19	May 8
5 years in 10 later than--	Apr. 1	Apr. 9	Apr. 27
First freezing temperature in fall:			
1 year in 10 earlier than--	Oct. 19	Oct. 3	Sept. 28
2 years in 10 earlier than--	Oct. 25	Oct. 8	Oct. 2
5 years in 10 earlier than--	Nov. 4	Oct. 19	Oct. 11

TABLE 3.--GROWING SEASON

(Recorded in the period 1951-84 at Arcadia, Missouri)

Probability	Daily minimum temperature during growing season		
	Higher than 24^{o} F	Higher than 28^{o} F	Higher than 32^{o} F
	Days	Days	Days
9 years in 10	197	172	144
8 years in 10	204	179	152
5 years in 10	216	192	167
2 years in 10	228	205	181
1 year in 10	234	212	189

TABLE 4.--ACREAGE AND PROPORTIONATE EXTENT OF THE SOILS

Map symbol	Soil name	Acres	Percent
1C	Lamotte silt loam, 3 to 9 percent slopes	550	0.2
2B	Gatewood silt loam, 2 to 5 percent slopes	840	0.2
2C	Gatewood silt loam, 5 to 9 percent slopes	4,450	1.3
2D	Gatewood silt loam, 9 to 14 percent slopes	1,700	0.5
2E	Gatewood silt loam, 14 to 20 percent slopes, stony	1,450	0.4
4C	Knobtop silt loam, 3 to 9 percent slopes	2,850	0.8
4D	Knobtop silt loam, 3 to 12 percent slopes, very stony	7,100	2.0
6C	Delassus silt loam, 3 to 9 percent slopes	4,900	1.4
6D	Delassus silt loam, 5 to 14 percent slopes, bouldery	830	0.2
9C	Viraton silt loam, 3 to 9 percent slopes	3,550	1.0
10E	Killarney very cobbly silt loam, 14 to 50 percent slopes, rubbly	29,000	8.2
11C	Lebanon silt loam, 3 to 9 percent slopes	8,800	2.5
12E	Goss very cherty silt loam, 14 to 35 percent slopes	39,000	11.0
13F	Clarksville very cherty silt loam, 25 to 50 percent slopes	82,500	23.3
18C	Courtois silt loam, 3 to 9 percent slopes	7,200	2.0
18D	Courtois silt loam, 9 to 14 percent slopes	5,100	1.4
19B	Crider silt loam, 2 to 5 percent slopes	1,050	0.3
19C	Crider silt loam, 5 to 9 percent slopes	590	0.2
20B	Fourche silt loam, 2 to 5 percent slopes	3,250	0.9
20C	Fourche silt loam, 5 to 9 percent slopes	5,600	1.6
22D	Wilderness very cherty silt loam, 5 to 14 percent slopes	37,500	10.6
22E	Wilderness very cherty silt loam, 14 to 30 percent slopes	11,400	3.2
25A	Auxvasse silt loam, 0 to 3 percent slopes	2,350	0.7
31A	Loughboro silt loam, 0 to 3 percent slopes	135	*
35C	Viburnum silt loam, 3 to 9 percent slopes	17,000	4.8
36B	Lowell silt loam, 2 to 5 percent slopes	2,850	0.8
41D	Gasconade flaggy silty clay loam, 5 to 20 percent slopes, extremely stony	1,700	0.5
42F	Irondale very cobbly silt loam, 15 to 40 percent slopes, rubbly	32,250	9.1
43E	Syenite silt loam, 10 to 25 percent slopes, extremely bouldery	1,650	0.5
45F	Taumsauk-Irondale-Rock outcrop complex, 15 to 40 percent slopes, rubbly	3,000	0.9
52B	Secesh silt loam, 1 to 4 percent slopes	4,050	1.2
67	Wakeland silt loam	1,500	0.4
80B	Bloomsdale very gravelly loam, 0 to 4 percent slopes	3,450	1.0
81A	Midco cherty loam, 0 to 3 percent slopes	19,900	5.6
82A	Dameron silt loam, clayey substratum, 0 to 3 percent slopes	3,500	1.0
91	Udipsamments, sloping	680	0.2
94	Pits and dumps	195	0.1
	Total	353,420	100.0

* Less than 0.1 percent.

TABLE 5.--PRIME FARMLAND

(Only the soils considered prime farmland are listed. Urban or built-up areas of the soils listed are not considered prime farmland. If a soil is prime farmland only under certain conditions, the conditions are specified in parentheses after the soil name)

Map symbol	Soil name
19B	Crider silt loam, 2 to 5 percent slopes
20B	Fourche silt loam, 2 to 5 percent slopes
25A	Auxvasse silt loam, 0 to 3 percent slopes (where drained)
31A	Loughboro silt loam, 0 to 3 percent slopes (where drained)
36B	Lowell silt loam, 2 to 5 percent slopes
52B	Secesh silt loam, 1 to 4 percent slopes
67	Wakeland silt loam (where protected from flooding or not frequently flooded during the growing season)
82A	Dameron silt loam, clayey substratum, 0 to 3 percent slopes (where protected from flooding or not frequently flooded during the growing season)

TABLE 6.--LAND CAPABILITY CLASSES AND YIELDS PER ACRE OF CROPS AND PASTURE

(Yields are those that can be expected under a high level of management. Absence of a yield indicates that the soil is not suited to the crop or the crop generally is not grown on the soil)

Soil name and map symbol	Land capability	Soybeans	Grain sorghum	Winter wheat	Tall fescue-red clover hay	Tall fescue hay	Tall fescue	Big bluestem
		Bu	Bu	Bu	Tons	Tons	AUM*	Tons
1C------------- Lamotte	IIIe	28	65	32	3.5	2.5	7.0	4.2
2B------------- Gatewood	IVe	---	---	20	3.2	2.3	4.6	3.4
2C------------- Gatewood	IVe	---	---	18	3.0	2.0	4.2	3.4
2D------------- Gatewood	VIe	---	---	---	2.5	1.7	3.6	3.2
2E------------- Gatewood	VIIs	---	---	---	---	1.5	3.0	3.0
4C------------- Knobtop	IIIe	---	---	---	2.7	1.8	4.0	3.2
4D------------- Knobtop	IVe	---	---	---	---	1.7	3.5	3.0
6C------------- Delassus	IIIe	---	---	24	3.0	2.4	5.3	3.6
6D------------- Delassus	IVe	---	---	---	---	2.0	4.2	3.4
9C------------- Viraton	IIIe	---	---	25	3.3	2.2	4.5	3.8
10E------------ Killarney	VIIs	---	---	---	---	---	2.3	2.5
11C------------ Lebanon	IIIe	---	---	32	3.2	2.3	5.2	3.4
12E------------ Goss	VIIe	---	---	---	---	---	3.0	2.9
13F------------ Clarksville	VIIe	---	---	---	---	---	2.0	2.9
18C------------ Courtois	IIIe	---	---	30	3.4	2.4	6.6	4.0
18D------------ Courtois	IVe	---	---	25	2.2	3.2	5.1	4.0
19B------------ Crider	IIe	40	75	35	4.0	3.0	7.5	4.2
19C------------ Crider	IIIe	32	65	32	3.5	2.5	7.0	4.0
20B------------ Fourche	IIe	34	78	38	4.0	3.1	7.8	4.2

See footnote at end of table.

TABLE 6.--LAND CAPABILITY CLASSES AND YIELDS PER ACRE OF CROPS AND PASTURE--Continued

Soil name and map symbol	Land capability	Soybeans	Grain sorghum	Winter wheat	Tall fescue-red clover hay	Tall fescue hay	Tall fescue	Big bluestem
		Bu	Bu	Bu	Tons	Tons	AUM*	Tons
20C------------- Fourche	IIIe	32	75	35	3.8	3.0	7.5	4.0
22D------------- Wilderness	VIs	---	---	---	2.0	1.4	2.8	2.5
22E------------- Wilderness	VIIs	---	---	---	---	---	2.4	2.2
25A------------- Auxvasse	IIIw	32	65	35	3.5	2.4	6.5	3.2
31A------------- Loughboro	IIIw	31	65	35	3.3	2.4	6.4	3.0
35C------------- Viburnum	IIIe	---	---	28	3.6	2.2	6.0	4.0
36B------------- Lowell	IIe	---	---	35	3.7	2.9	7.4	4.0
41D------------- Gasconade	VIIs	---	---	---	---	---	2.0	---
42F------------- Irondale	VIIs	---	---	---	---	---	---	---
43E------------- Syenite	VIIe	---	---	---	---	---	2.0	---
45F------------- Taumsauk-Irondale-Rock outcrop	VIIs	---	---	---	---	---	---	---
52B------------- Secesh	IIs	35	70	35	3.5	2.5	7.0	3.6
67-------------- Wakeland	IIIw	35	70	30	3.0	2.5	7.0	---
80B------------- Bloomsdale	IVw	25	60	30	2.8	2.0	5.5	3.4
81A------------- Midco	IIIw	---	---	25	2.5	2.0	5.2	3.2
82A------------- Dameron	IIw	30	70	35	3.5	2.5	7.0	3.5
91. Udipsamments								
94. Pits and dumps								

* Animal-unit-month: The amount of forage or feed required to feed one animal unit (one cow, one horse, one mule, five sheep, or five goats) for 30 days.

TABLE 7.--WOODLAND MANAGEMENT AND PRODUCTIVITY

(Only the soils suitable for production of commercial trees are listed. Absence of an entry indicates that information was not available)

Soil name and map symbol	Ordination symbol	Management concerns				Potential productivity			Trees to plant
		Erosion hazard	Equipment limitation	Seedling mortality	Windthrow hazard	Common trees	Site index	Volume*	
1C--------------- Lamotte	3A	Slight	Slight	Slight	Slight	White oak----------- Northern red oak---- Shortleaf pine------ Black oak-----------	62 82 64 ---	45 64 97 ---	Black oak, shortleaf pine, scarlet oak, white oak, black walnut.
2B, 2C, 2D------ Gatewood	2A	Slight	Slight	Slight	Slight	White oak----------- Eastern redcedar---- Post oak------------ Black oak-----------	45 --- --- ---	30 --- --- ---	Eastern redcedar, shortleaf pine.
2E-------------- Gatewood	2R	Moderate	Moderate	Slight	Moderate	White oak----------- Chinkapin oak------- Eastern redcedar---- Sugar maple--------- White ash-----------	45 --- --- --- ---	30 --- --- --- ---	Eastern redcedar, shortleaf pine.
4C-------------- Knobtop	2A	Slight	Slight	Slight	Slight	Black oak----------- Northern red oak----	45 47	30 30	Shortleaf pine, eastern redcedar, northern red oak, black oak.
4D-------------- Knobtop	2X	Slight	Moderate	Slight	Slight	Black oak----------- Northern red oak----	45 47	30 32	Shortleaf pine, eastern redcedar, northern red oak, black oak.
6C-------------- Delassus	3A	Slight	Slight	Slight	Slight	Northern red oak---- Shortleaf pine------ White oak----------- Black oak-----------	60 --- --- ---	43 --- --- ---	Shortleaf pine, northern red oak, white oak, black oak.
6D-------------- Delassus	3X	Slight	Moderate	Slight	Slight	Northern red oak---- Shortleaf pine------ White oak----------- Black oak-----------	60 --- --- ---	43 --- --- ---	Shortleaf pine, northern red oak, white oak, black oak.
9C-------------- Viraton	3D	Slight	Slight	Moderate	Moderate	White oak----------- Black oak----------- Shortleaf pine------	55 60 56	38 43 80	White oak, black oak, shortleaf pine.
10E------------- Killarney	3R	Moderate	Moderate	Moderate	Moderate	White oak----------- Northern red oak---- Shortleaf pine------	55 60 55	38 43 78	Shortleaf pine, northern red oak, white oak.

See footnote at end of table.

TABLE 7.--WOODLAND MANAGEMENT AND PRODUCTIVITY--Continued

Soil name and map symbol	Ordination symbol	Management concerns: Erosion hazard	Management concerns: Equipment limitation	Management concerns: Seedling mortality	Management concerns: Windthrow hazard	Potential productivity: Common trees	Potential productivity: Site index	Potential productivity: Volume*	Trees to plant
11C------------- Lebanon	3D	Slight	Slight	Slight	Moderate	White oak---------- Black oak---------- Shortleaf pine------	55 60 ---	38 43 ---	Shortleaf pine, white oak, black oak.
12E------------- Goss	3R	Moderate	Moderate	Moderate	Slight	White oak---------- Shortleaf pine------ Post oak----------- Blackjack oak------- Black oak----------	60 --- --- --- ---	43 --- --- --- ---	Yellow poplar, white ash, white oak, shortleaf pine, northern red oak.
13F------------- Clarksville	3R	Moderate	Severe	Severe	Slight	White oak---------- Shortleaf pine------ Black oak---------- Northern red oak----	58 61 61 61	41 90 44 44	White oak, shortleaf pine, yellow poplar.
18C, 18D-------- Courtois	3A	Slight	Slight	Slight	Slight	White oak---------- Shortleaf pine------ Northern red oak----	60 75 ---	43 120 ---	Shortleaf pine.
19B, 19C-------- Crider	4A	Slight	Slight	Slight	Slight	White oak---------- Black oak---------- Hickory------------ Northern red oak---- Shortleaf pine------	72 87 --- 84 ---	54 69 --- 66 ---	Eastern white pine, yellow poplar, black walnut, white ash, northern red oak, white oak, shortleaf pine.
20B, 20C-------- Fourche	3A	Slight	Slight	Slight	Slight	White oak---------- White ash----------	63 72	46 69	White oak, shortleaf pine, eastern white pine, northern red oak, white ash, black oak.
22D------------- Wilderness	3D	Slight	Slight	Moderate	Moderate	White oak---------- Black oak----------	55 ---	38 ---	White oak, shortleaf pine, black oak.
22E------------- Wilderness	3R	Moderate	Moderate	Moderate	Moderate	White oak---------- Black oak----------	55 ---	38 ---	White oak, shortleaf pine, black oak.
25A------------- Auxvasse	4W	Slight	Severe	Moderate	Moderate	Pin oak------------ Northern red oak---- Silver maple-------- Green ash----------	76 --- --- ---	58 --- --- ---	Pin oak, white oak, green ash, yellow poplar, eastern cottonwood, silver maple.
31A------------- Loughboro	2W	Slight	Severe	Moderate	Moderate	White oak---------- Northern red oak----	52 ---	36 ---	Pin oak, white oak, white ash.

See footnote at end of table.

TABLE 7.--WOODLAND MANAGEMENT AND PRODUCTIVITY--Continued

Soil name and map symbol	Ordination symbol	Management concerns: Erosion hazard	Management concerns: Equipment limitation	Management concerns: Seedling mortality	Management concerns: Windthrow hazard	Potential productivity: Common trees	Potential productivity: Site index	Potential productivity: Volume*	Trees to plant
35C------------- Viburnum	3A	Slight	Slight	Slight	Slight	Black oak-----------	58	41	Shortleaf pine, northern red oak, white oak.
						White oak-----------	---	---	
						Northern red oak----	---	---	
						Post oak------------	---	---	
						Hickory-------------	---	---	
						Blackjack oak-------	---	---	
36B------------- Lowell	4C	Slight	Slight	Slight	Slight	Northern red oak----	70	52	Eastern white pine, yellow poplar.
						Yellow poplar-------	---	---	
41D------------- Gasconade	2X	Slight	Moderate	Severe	Severe	Chinkapin oak-------	40	26	Eastern redcedar.
						Eastern redcedar----	30	---	
						White ash-----------	---	---	
						Sugar maple---------	---	---	
						Mockernut hickory---	---	---	
						Post oak------------	---	---	
						Blackjack oak-------	---	---	
42F------------- Irondale	2X	Moderate	Moderate	Moderate	Slight	White oak-----------	45	30	Shortleaf pine.
						Black oak-----------	48	32	
						Northern red oak----	45	30	
						Shortleaf pine------	---	---	
43E------------- Syenite	2R	Moderate	Severe	Moderate	Moderate	White oak-----------	46	31	Shortleaf pine, white oak, northern red oak.
						Northern red oak----	---	---	
						Black oak-----------	---	---	
45F: Taumsauk.									
Irondale--------	2X	Moderate	Moderate	Moderate	Slight	White oak-----------	45	30	Shortleaf pine.
						Black oak-----------	48	32	
						Northern red oak----	45	30	
						Shortleaf pine------	---	---	
Rock outcrop.									
52B------------- Secesh	3A	Slight	Slight	Slight	Slight	White oak-----------	60	43	Black walnut, shortleaf pine, American sycamore.
						Shortleaf pine------	---	---	
						American sycamore---	---	---	
						Black walnut--------	---	---	
						Black oak-----------	---	---	
67-------------- Wakeland	5A	Slight	Slight	Slight	Slight	Pin oak-------------	90	72	Eastern white pine, American sycamore, green ash.
						Yellow poplar-------	90	90	
80B------------- Bloomsdale	3F	Slight	Moderate	Moderate	Slight	Northern red oak----	58	41	Shortleaf pine.
						White oak-----------	---	---	
						American sycamore---	---	---	
81A------------- Midco	3F	Slight	Moderate	Moderate	Slight	White oak-----------	55	38	White oak, shortleaf pine.
						American sycamore---	---	---	
						Shortleaf pine------	---	---	
						Black oak-----------	60	43	

See footnote at end of table.

TABLE 7.--WOODLAND MANAGEMENT AND PRODUCTIVITY--Continued

Soil name and map symbol	Ordination symbol	Management concerns				Potential productivity			Trees to plant
		Erosion hazard	Equipment limitation	Seedling mortality	Windthrow hazard	Common trees	Site index	Volume*	
82A------------- Dameron	5A	Slight	Slight	Slight	Slight	Green ash-----------	70	33	Black walnut.
						Black walnut--------	72	---	
						American sycamore---	---	---	
						White oak-----------	---	---	
						Sugar maple---------	---	---	

* Volume is the yield in cubic feet per acre per year calculated at the age of culmination of mean annual increment for fully stocked natural stands.

TABLE 8.--WINDBREAKS AND ENVIRONMENTAL PLANTINGS

(The symbol < means less than; > means more than. Absence of an entry indicates that trees generally do not grow to the given height on that soil)

Soil name and map symbol	Trees having predicted 20-year average height, in feet, of--				
	<8	8-15	16-25	26-35	>35
1C----------------- Lamotte	---	Amur honeysuckle, autumn olive, Amur maple, lilac.	Eastern redcedar, hackberry, Russian olive.	Norway spruce, green ash, honeylocust, pin oak, eastern white pine.	---
2B, 2C, 2D--------- Gatewood	Amur honeysuckle, lilac, fragrant sumac.	Autumn olive------	Russian olive, eastern redcedar, hackberry, bur oak, green ash, Austrian pine.	Honeylocust, Siberian elm.	---
2E----------------- Gatewood	Amur honeysuckle, fragrant sumac.	Autumn olive------	Lilac, Russian olive, eastern redcedar, hackberry, bur oak, green ash, Austrian pine.	Honeylocust, Siberian elm.	---
4C, 4D------------- Knobtop	Amur honeysuckle, lilac, fragrant sumac.	Autumn olive------	Austrian pine, honeylocust, eastern redcedar, bur oak, Russian olive, green ash, hackberry.	Siberian elm------	---
6C----------------- Delassus	Lilac-------------	Amur maple, autumn olive, Amur honeysuckle, Manchurian crabapple.	Austrian pine, eastern redcedar, Russian olive, green ash, hackberry, jack pine.	Honeylocust-------	---
6D----------------- Delassus	Amur honeysuckle, lilac, fragrant sumac.	Autumn olive------	Austrian pine, honeylocust, eastern redcedar, hackberry, green ash, bur oak, Russian olive.	Siberian elm------	---
9C----------------- Viraton	Lilac-------------	Manchurian crabapple, Amur honeysuckle, Amur maple, autumn olive.	Eastern redcedar, Austrian pine, hackberry, green ash, jack pine, Russian olive.	Honeylocust-------	---
10E---------------- Killarney	Amur honeysuckle, fragrant sumac, lilac.	Autumn olive------	Russian olive, Austrian pine, eastern redcedar, bur oak, hackberry, green ash, honeylocust.	Siberian elm------	---
11C---------------- Lebanon	Lilac-------------	Amur honeysuckle, Amur maple, autumn olive, Manchurian crabapple.	Austrian pine, eastern redcedar, jack pine, green ash, Russian olive, hackberry.	Honeylocust-------	---

TABLE 8.--WINDBREAKS AND ENVIRONMENTAL PLANTINGS--Continued

Soil name and map symbol	Trees having predicted 20-year average height, in feet, of-- <8	8-15	16-25	26-35	>35
12E---------------- Goss	Amur honeysuckle, lilac, fragrant sumac.	Autumn olive------	Eastern redcedar, Austrian pine, honeylocust, hackberry, green ash, bur oak, Russian olive.	Siberian elm------	---
13F---------------- Clarksville	Amur honeysuckle, lilac, fragrant sumac.	Autumn olive------	Eastern redcedar, Austrian pine, honeylocust, hackberry, green ash, bur oak, Russian olive.	Siberian elm------	---
18C, 18D---------- Courtois	---	Amur honeysuckle, Amur maple, autumn olive, lilac.	Eastern redcedar, hackberry, Russian olive.	Eastern white pine, Norway spruce, green ash, honeylocust, pin oak.	---
19B, 19C---------- Crider	---	Amur honeysuckle, lilac, Amur maple, autumn olive.	Eastern redcedar, hackberry, Russian olive.	Green ash, honeylocust, Norway spruce, eastern white pine, pin oak.	---
20B, 20C---------- Fourche	---	Lilac, Amur maple, autumn olive, Amur honeysuckle.	Eastern redcedar	Austrian pine, green ash, honeylocust, eastern white pine, hackberry, pin oak.	Eastern cottonwood.
22D, 22E---------- Wilderness	Amur honeysuckle, lilac, fragrant sumac.	Autumn olive------	Honeylocust, Austrian pine, hackberry, eastern redcedar, green ash, bur oak, Russian olive.	Siberian elm------	---
25A---------------- Auxvasse	---	Amur honeysuckle, lilac, Amur maple, autumn olive.	Eastern redcedar	Austrian pine, hackberry, green ash, pin oak, honeylocust, eastern white pine.	Eastern cottonwood.
31A---------------- Loughboro	Lilac-------------	Amur maple, autumn olive, Amur honeysuckle, Manchurian crabapple.	Austrian pine, eastern redcedar, jack pine, hackberry, green ash, Russian olive.	Honeylocust-------	---
35C---------------- Viburnum	Amur honeysuckle, fragrant sumac, lilac.	Autumn olive------	Russian olive, Austrian pine, eastern redcedar, bur oak, hackberry, green ash, honeylocust.	Siberian elm------	---

TABLE 8.--WINDBREAKS AND ENVIRONMENTAL PLANTINGS--Continued

Soil name and map symbol	Trees having predicted 20-year average height, in feet, of--				
	<8	8-15	16-25	26-35	>35
36B Lowell	---	Amur honeysuckle, lilac, Amur maple, autumn olive.	Eastern redcedar, hackberry, Russian olive.	Norway spruce, honeylocust, eastern white pine, green ash, pin oak.	---
42F Irondale	Amur honeysuckle, lilac, fragrant sumac.	Autumn olive	Austrian pine, honeylocust, eastern redcedar, green ash, bur oak, Russian olive, hackberry.	Siberian elm	---
43E Syenite	Amur honeysuckle, lilac, fragrant sumac.	Autumn olive	Austrian pine, eastern redcedar, bur oak, Russian olive, green ash, hackberry.	Honeylocust, Siberian elm.	---
45F: Taumsauk.					
Irondale	Amur honeysuckle, lilac, fragrant sumac.	Autumn olive	Austrian pine, honeylocust, eastern redcedar, green ash, bur oak, Russian olive, hackberry.	Siberian elm	---
Rock outcrop.					
52B Secesh	---	Autumn olive, Amur honeysuckle, Amur maple, lilac.	Eastern redcedar	Austrian pine, honeylocust, pin oak, eastern white pine, hackberry, green ash.	Eastern cottonwood.
67 Wakeland	---	Amur honeysuckle, Amur privet, American cranberrybush, silky dogwood.	Northern whitecedar, Austrian pine, white fir, blue spruce, Washington hawthorn.	Norway spruce	Eastern white pine, pin oak.
81A Midco	---	Autumn olive, Amur honeysuckle, Amur maple, lilac.	Eastern redcedar	Austrian pine, honeylocust, pin oak, eastern white pine, hackberry, green ash.	Eastern cottonwood.

TABLE 9.--RECREATIONAL DEVELOPMENT

(Some terms that describe restrictive soil features are defined in the Glossary. See text for definitions of "slight," "moderate," and "severe." Absence of an entry indicates that the soil was not rated)

Soil name and map symbol	Camp areas	Picnic areas	Playgrounds	Paths and trails	Golf fairways
1C Lamotte	Moderate: percs slowly.	Moderate: percs slowly.	Severe: slope.	Slight	Slight.
2B Gatewood	Moderate: percs slowly.	Moderate: percs slowly.	Moderate: slope, small stones, thin layer.	Slight	Moderate: large stones.
2C Gatewood	Moderate: percs slowly.	Moderate: percs slowly.	Severe: slope.	Slight	Moderate: large stones.
2D Gatewood	Moderate: slope, percs slowly.	Moderate: slope, percs slowly.	Severe: slope.	Slight	Moderate: large stones, slope.
2E Gatewood	Severe: slope.	Severe: slope.	Severe: slope, large stones.	Moderate: slope.	Severe: slope.
4C Knobtop	Moderate: slope, wetness, percs slowly.	Moderate: slope, wetness, percs slowly.	Severe: slope.	Severe: erodes easily.	Moderate: slope, thin layer, area reclaim.
4D Knobtop	Moderate: large stones, wetness.	Moderate: large stones, wetness.	Severe: large stones, slope.	Slight	Moderate: large stones, thin layer.
6C Delassus	Severe: percs slowly.	Severe: percs slowly.	Severe: slope, percs slowly.	Slight	Moderate: large stones.
6D Delassus	Severe: percs slowly.	Severe: percs slowly.	Severe: large stones, slope, percs slowly.	Severe: erodes easily.	Moderate: large stones, droughty, slope.
9C Viraton	Severe: percs slowly.	Severe: percs slowly.	Severe: slope, percs slowly.	Severe: erodes easily.	Moderate: wetness.
10E Killarney	Severe: slope, large stones, percs slowly.	Severe: slope, large stones, percs slowly.	Severe: large stones, slope, small stones.	Severe: slope.	Severe: large stones, slope.
11C Lebanon	Severe: wetness, percs slowly.	Severe: percs slowly.	Severe: slope, wetness, percs slowly.	Moderate: wetness.	Moderate: wetness, droughty.
12E Goss	Severe: slope.	Severe: slope.	Severe: slope, small stones.	Moderate: slope.	Severe: droughty, slope.
13F Clarksville	Severe: slope, small stones.	Severe: slope, small stones.	Severe: slope, small stones.	Severe: slope, small stones.	Severe: small stones, slope.

TABLE 9.--RECREATIONAL DEVELOPMENT--Continued

Soil name and map symbol	Camp areas	Picnic areas	Playgrounds	Paths and trails	Golf fairways
18C------------------- Courtois	Slight----------	Slight----------	Severe: slope.	Slight----------	Slight.
18D------------------- Courtois	Moderate: slope.	Moderate: slope.	Severe: slope.	Severe: erodes easily.	Moderate: slope.
19B------------------- Crider	Slight----------	Slight----------	Moderate: slope.	Slight----------	Slight.
19C------------------- Crider	Moderate: slope.	Moderate: slope.	Severe: slope.	Slight----------	Moderate: slope.
20B------------------- Fourche	Moderate: wetness, percs slowly.	Moderate: wetness, percs slowly.	Moderate: slope, wetness, percs slowly.	Severe: erodes easily.	Moderate: wetness.
20C------------------- Fourche	Moderate: wetness, percs slowly.	Moderate: wetness, percs slowly.	Severe: slope.	Severe: erodes easily.	Moderate: wetness.
22D------------------- Wilderness	Severe: wetness.	Moderate: slope, wetness, small stones.	Severe: slope, small stones, wetness.	Moderate: wetness.	Severe: droughty.
22E------------------- Wilderness	Severe: slope, wetness.	Severe: slope.	Severe: slope, small stones, wetness.	Moderate: wetness, slope.	Severe: droughty, slope.
25A------------------- Auxvasse	Severe: wetness, percs slowly.	Severe: percs slowly.	Severe: wetness, percs slowly.	Moderate: wetness.	Moderate: wetness.
31A------------------- Loughboro	Severe: wetness.	Moderate: wetness, percs slowly.	Severe: wetness.	Moderate: wetness.	Moderate: wetness.
35C------------------- Viburnum	Moderate: wetness.	Moderate: wetness.	Severe: slope.	Moderate: wetness.	Moderate: wetness.
36B------------------- Lowell	Moderate: percs slowly.	Moderate: percs slowly.	Moderate: slope, percs slowly.	Severe: erodes easily.	Slight.
41D------------------- Gasconade	Severe: large stones, thin layer.	Severe: thin layer.	Severe: large stones, slope, thin layer.	Severe: large stones.	Severe: large stones, thin layer.
42F------------------- Irondale	Severe: slope, large stones, small stones.	Severe: slope, large stones, small stones.	Severe: large stones, slope, small stones.	Severe: slope.	Severe: small stones, slope.
43E------------------- Syenite	Severe: slope, large stones.	Severe: slope, large stones.	Severe: large stones, slope.	Moderate: slope.	Severe: slope.

TABLE 9.--RECREATIONAL DEVELOPMENT--Continued

Soil name and map symbol	Camp areas	Picnic areas	Playgrounds	Paths and trails	Golf fairways
45F:					
Taumsauk	Severe: slope, thin layer, area reclaim.	Severe: slope, thin layer, area reclaim.	Severe: slope, small stones, large stones.	Severe: slope.	Severe: droughty, slope, large stones.
Irondale	Severe: slope, small stones.	Severe: slope, small stones.	Severe: large stones, slope, small stones.	Severe: slope.	Severe: small stones, slope.
Rock outcrop.					
52B Secesh	Severe: flooding.	Slight	Moderate: slope, small stones.	Slight	Moderate: large stones.
67 Wakeland	Severe: flooding, wetness.	Moderate: flooding, wetness.	Severe: wetness, flooding.	Moderate: wetness, flooding.	Severe: flooding.
80B Bloomsdale	Severe: flooding, small stones.	Severe: small stones.	Severe: small stones, flooding.	Severe: small stones.	Severe: small stones, flooding.
81A Midco	Severe: flooding.	Moderate: flooding, small stones.	Severe: small stones, flooding.	Moderate: flooding.	Severe: droughty, flooding.
82A Dameron	Severe: flooding.	Moderate: flooding, percs slowly.	Severe: flooding.	Moderate: flooding.	Severe: flooding.
91. Udipsamments					
94. Pits and dumps					

TABLE 10.--WILDLIFE HABITAT

(See text for definitions of "good," "fair," "poor," and "very poor." Absence of an entry indicates that the soil was not rated)

Soil name and map symbol	Potential for habitat elements							Potential as habitat for--		
	Grain and seed crops	Grasses and legumes	Wild herbaceous plants	Hardwood trees	Coniferous plants	Wetland plants	Shallow water areas	Openland wildlife	Woodland wildlife	Wetland wildlife
1C----------------- Lamotte	Fair	Good	Good	Good	Good	Poor	Very poor.	Good	Good	Very poor.
2B, 2C, 2D--------- Gatewood	Fair	Good	Good	Fair	Fair	Very poor.	Very poor.	Good	Fair	Very poor.
2E----------------- Gatewood	Poor	Fair	Fair	Poor	Poor	Very poor.	Very poor.	Fair	Poor	Very poor.
4C----------------- Knobtop	Fair	Good	Good	Good	Good	Very poor.	Very poor.	Good	Good	Very poor.
4D----------------- Knobtop	Very poor.	Very poor.	Fair	Good	Good	Very poor.	Very poor.	Poor	Fair	Very poor.
6C----------------- Delassus	Fair	Good	Good	Good	Good	Poor	Very poor.	Good	Good	Very poor.
6D----------------- Delassus	Poor	Fair	Fair	Good	Good	Poor	Very poor.	Fair	Good	Very poor.
9C----------------- Viraton	Fair	Good	Good	Fair	Fair	Poor	Very poor.	Good	Fair	Very poor.
10E---------------- Killarney	Very poor.	Very poor.	Fair	Poor	Poor	Very poor.	Very poor.	Poor	Poor	Very poor.
11C---------------- Lebanon	Fair	Good	Good	Fair	Fair	Poor	Very poor.	Good	Fair	Very poor.
12E---------------- Goss	Poor	Fair	Fair	Fair	Fair	Very poor.	Very poor.	Fair	Fair	Very poor.
13F---------------- Clarksville	Very poor.	Poor	Fair	Fair	Fair	Very poor.	Very poor.	Poor	Fair	Very poor.
18C, 18D----------- Courtois	Fair	Good	Good	Good	Good	Very poor.	Very poor.	Good	Good	Very poor.
19B---------------- Crider	Good	Good	Good	Good	Good	Poor	Very poor.	Good	Good	Very poor.
19C---------------- Crider	Fair	Good	Good	Good	Good	Very poor.	Very poor.	Good	Good	Very poor.
20B, 20C----------- Fourche	Fair	Good	Good	Good	Good	Poor	Very poor.	Good	Good	Very poor.
22D, 22E----------- Wilderness	Poor	Poor	Very poor.	Poor	Poor	Poor	Very poor.	Poor	Poor	Very poor.
25A---------------- Auxvasse	Fair	Good	Poor	Good	Good	Good	Fair	Fair	Good	Fair.
31A---------------- Loughboro	Poor	Fair	Fair	Fair	Fair	Good	Good	Fair	Fair	Good.

TABLE 10.--WILDLIFE HABITAT--Continued

Soil name and map symbol	Potential for habitat elements: Grain and seed crops	Grasses and legumes	Wild herbaceous plants	Hardwood trees	Coniferous plants	Wetland plants	Shallow water areas	Potential as habitat for--: Openland wildlife	Woodland wildlife	Wetland wildlife
35C: Viburnum	Fair	Good	Good	Good	Good	Very poor.	Very poor.	Good	Good	Very poor.
36B: Lowell	Fair	Good	Good	Good	Good	Poor	Very poor.	Good	Good	Very poor.
41D: Gasconade	Very poor.	Poor	Poor	Poor	Poor	Very poor.	Very poor.	Poor	Poor	Very poor.
42F: Irondale	Very poor.	Poor	Very poor.	Fair	Fair	Very poor.	Very poor.	Very poor.	Poor	Very poor.
43E: Syenite	Very poor.	Poor	Very poor.	Fair	Fair	Very poor.	Very poor.	Very poor.	Poor	Very poor.
45F:										
Taumsauk	Very poor.	Very poor.	Poor	Very poor.	Very poor.	Very poor.	Very poor.	Very poor.	Very poor.	Very poor.
Irondale	Very poor.	Poor	Very poor.	Fair	Fair	Very poor.	Very poor.	Very poor.	Poor	Very poor.
Rock outcrop.										
52B: Secesh	Good	Good	Good	Good	Good	Very poor.	Very poor.	Good	Good	Very poor.
67: Wakeland	Poor	Fair	Fair	Good	Good	Fair	Fair	Fair	Good	Fair.
80B: Bloomsdale	Poor	Fair	Fair	Good	Good	Poor	Very poor.	Fair	Good	Very poor.
81A: Midco	Fair	Fair	Fair	Fair	Fair	Very poor.	Very poor.	Fair	Fair	Very poor.
82A: Dameron	Poor	Fair	Fair	Good	Good	Poor	Poor	Fair	Good	Poor.
91. Udipsamments										
94. Pits and dumps										

TABLE 11.--BUILDING SITE DEVELOPMENT

(Some terms that describe restrictive soil features are defined in the Glossary. See text for definitions of "slight," "moderate," and "severe." Absence of an entry indicates that the soil was not rated. The information in this table indicates the dominant soil condition but does not eliminate the need for onsite investigation)

Soil name and map symbol	Shallow excavations	Dwellings without basements	Dwellings with basements	Small commercial buildings	Local roads and streets	Lawns and landscaping
1C Lamotte	Slight	Moderate: shrink-swell.	Moderate: shrink-swell.	Moderate: shrink-swell, slope.	Severe: low strength.	Slight.
2B, 2C Gatewood	Severe: depth to rock.	Severe: shrink-swell.	Severe: depth to rock, shrink-swell.	Severe: shrink-swell.	Severe: shrink-swell, low strength.	Moderate: large stones.
2D Gatewood	Severe: depth to rock.	Severe: shrink-swell.	Severe: depth to rock, shrink-swell.	Severe: shrink-swell, slope.	Severe: shrink-swell, low strength.	Moderate: large stones, slope.
2E Gatewood	Severe: depth to rock, slope.	Severe: slope, shrink-swell.	Severe: depth to rock, shrink-swell, slope.	Severe: shrink-swell, slope.	Severe: shrink-swell, low strength, slope.	Severe: slope.
4C Knobtop	Severe: depth to rock, wetness.	Moderate: wetness, shrink-swell, slope.	Severe: wetness, depth to rock.	Severe: slope.	Severe: low strength, frost action.	Moderate: slope, thin layer, area reclaim.
4D Knobtop	Severe: depth to rock, wetness.	Moderate: wetness, shrink-swell.	Severe: wetness, depth to rock.	Moderate: wetness, shrink-swell, slope.	Severe: low strength, frost action.	Moderate: large stones, thin layer.
6C Delassus	Severe: wetness.	Moderate: wetness, shrink-swell.	Severe: wetness.	Moderate: wetness, shrink-swell, slope.	Severe: low strength.	Moderate: large stones.
6D Delassus	Severe: wetness.	Moderate: wetness, shrink-swell, slope.	Severe: wetness.	Severe: slope.	Severe: low strength.	Moderate: large stones, droughty, slope.
9C Viraton	Severe: wetness.	Moderate: wetness.	Severe: wetness.	Moderate: wetness, slope.	Moderate: wetness, frost action.	Moderate: wetness.
10E Killarney	Severe: large stones, wetness, slope.	Severe: slope, large stones.	Severe: wetness, slope, large stones.	Severe: slope, large stones.	Severe: low strength, slope, large stones.	Severe: large stones, slope.
11C Lebanon	Severe: wetness.	Severe: wetness.	Severe: wetness.	Severe: wetness.	Severe: low strength.	Moderate: wetness, droughty.
12E Goss	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: droughty, slope.
13F Clarksville	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: small stones, slope.

TABLE 11.--BUILDING SITE DEVELOPMENT--Continued

Soil name and map symbol	Shallow excavations	Dwellings without basements	Dwellings with basements	Small commercial buildings	Local roads and streets	Lawns and landscaping
18C Courtois	Moderate: too clayey.	Moderate: shrink-swell.	Moderate: shrink-swell.	Moderate: shrink-swell, slope.	Severe: low strength.	Slight.
18D Courtois	Moderate: too clayey, slope.	Moderate: shrink-swell, slope.	Moderate: slope, shrink-swell.	Severe: slope.	Severe: low strength.	Moderate: slope.
19B Crider	Moderate: too clayey.	Slight	Slight	Moderate: slope.	Severe: low strength.	Slight.
19C Crider	Moderate: too clayey, slope.	Moderate: slope.	Moderate: slope.	Severe: slope.	Severe: low strength.	Moderate: slope.
20B Fourche	Severe: wetness.	Moderate: wetness, shrink-swell.	Severe: wetness.	Moderate: wetness, shrink-swell.	Severe: low strength.	Moderate: wetness.
20C Fourche	Severe: wetness.	Moderate: wetness, shrink-swell.	Severe: wetness.	Moderate: wetness, shrink-swell, slope.	Severe: low strength.	Moderate: wetness.
22D Wilderness	Severe: wetness.	Severe: wetness.	Severe: wetness.	Severe: wetness, slope.	Moderate: wetness, slope, frost action.	Severe: droughty.
22E Wilderness	Severe: wetness, slope.	Severe: wetness, slope.	Severe: wetness, slope.	Severe: wetness, slope.	Severe: slope.	Severe: droughty, slope.
25A Auxvasse	Severe: wetness.	Severe: wetness, shrink-swell.	Severe: wetness.	Severe: wetness, shrink-swell.	Severe: shrink-swell, low strength.	Moderate: wetness.
31A Loughboro	Severe: wetness.	Severe: wetness, shrink-swell.	Severe: wetness, shrink-swell.	Severe: wetness, shrink-swell.	Severe: low strength, frost action, shrink-swell.	Moderate: wetness.
35C Viburnum	Severe: wetness.	Severe: shrink-swell.	Severe: wetness, shrink-swell.	Severe: shrink-swell.	Severe: shrink-swell, low strength.	Moderate: wetness.
36B Lowell	Moderate: depth to rock, too clayey.	Moderate: shrink-swell.	Moderate: wetness, depth to rock.	Moderate: shrink-swell.	Severe: low strength.	Slight.
41D Gasconade	Severe: depth to rock, large stones.	Severe: depth to rock, large stones.	Severe: depth to rock, large stones.	Severe: slope, depth to rock, large stones.	Severe: depth to rock, large stones.	Severe: large stones, thin layer.
42F Irondale	Severe: depth to rock, slope.	Severe: slope.	Severe: depth to rock, slope.	Severe: slope.	Severe: slope.	Severe: small stones, slope.
43E Syenite	Severe: depth to rock, slope.	Severe: slope.	Severe: depth to rock, slope.	Severe: slope.	Severe: low strength, slope.	Severe: slope.

TABLE 11.--BUILDING SITE DEVELOPMENT--Continued

Soil name and map symbol	Shallow excavations	Dwellings without basements	Dwellings with basements	Small commercial buildings	Local roads and streets	Lawns and landscaping
45F:						
Taumsauk	Severe: depth to rock, slope.	Severe: depth to rock, slope.	Severe: depth to rock, slope.	Severe: slope, depth to rock.	Severe: slope, depth to rock.	Severe: droughty, slope, large stones.
Irondale	Severe: depth to rock, slope.	Severe: slope.	Severe: depth to rock, slope.	Severe: slope.	Severe: slope.	Severe: small stones, slope.
Rock outcrop.						
52B Secesh	Slight	Severe: flooding.	Severe: flooding.	Severe: flooding.	Moderate: flooding, frost action.	Moderate: large stones.
67 Wakeland	Severe: wetness.	Severe: flooding, wetness.	Severe: flooding, wetness.	Severe: flooding, wetness.	Severe: flooding, frost action.	Severe: flooding.
80B Bloomsdale	Moderate: too clayey, large stones, flooding.	Severe: flooding.	Severe: flooding.	Severe: flooding.	Severe: flooding.	Severe: small stones, flooding.
81A Midco	Severe: cutbanks cave.	Severe: flooding.	Severe: flooding.	Severe: flooding.	Severe: flooding.	Severe: droughty, flooding.
82A Dameron	Moderate: too clayey, flooding.	Severe: flooding.	Severe: flooding.	Severe: flooding.	Severe: low strength, flooding.	Severe: flooding.
91. Udipsamments						
94. Pits and dumps						

TABLE 12.--SANITARY FACILITIES

(Some terms that describe restrictive soil features are defined in the Glossary. See text for definitions of "slight," "fair," and other terms. Absence of an entry indicates that the soil was not rated. The information in this table indicates the dominant soil condition but does not eliminate the need for onsite investigation)

Soil name and map symbol	Septic tank absorption fields	Sewage lagoon areas	Trench sanitary landfill	Area sanitary landfill	Daily cover for landfill
1C----------------- Lamotte	Severe: percs slowly.	Moderate: seepage, slope.	Moderate: too clayey.	Slight-----------	Fair: too clayey.
2B----------------- Gatewood	Severe: thin layer, seepage, percs slowly.	Severe: depth to rock, seepage.	Severe: depth to rock, seepage.	Moderate: seepage.	Poor: area reclaim, too clayey, hard to pack.
2C----------------- Gatewood	Severe: thin layer, seepage, percs slowly.	Severe: depth to rock, slope, seepage.	Severe: depth to rock, seepage.	Moderate: seepage.	Poor: area reclaim, too clayey, hard to pack.
2D----------------- Gatewood	Severe: thin layer, seepage, percs slowly.	Severe: depth to rock, slope, seepage.	Severe: depth to rock, seepage.	Moderate: seepage, slope.	Poor: area reclaim, too clayey, hard to pack.
2E----------------- Gatewood	Severe: thin layer, seepage, percs slowly.	Severe: depth to rock, seepage, slope.	Severe: depth to rock, seepage.	Severe: slope.	Poor: area reclaim, too clayey, hard to pack.
4C----------------- Knobtop	Severe: thin layer, seepage, wetness.	Severe: depth to rock, seepage, slope.	Severe: depth to rock, seepage.	Moderate: seepage, slope.	Poor: area reclaim, thin layer.
4D----------------- Knobtop	Severe: thin layer, seepage, wetness.	Severe: depth to rock, seepage, slope.	Severe: depth to rock, seepage.	Moderate: seepage.	Poor: area reclaim, thin layer.
6C----------------- Delassus	Severe: wetness, percs slowly.	Severe: slope, wetness.	Severe: depth to rock, seepage.	Moderate: wetness.	Fair: area reclaim, wetness.
6D----------------- Delassus	Severe: wetness, percs slowly.	Severe: slope.	Severe: depth to rock, seepage.	Moderate: wetness, slope.	Fair: area reclaim, slope, large stones.
9C----------------- Viraton	Severe: wetness, percs slowly.	Severe: wetness.	Severe: wetness, too clayey.	Moderate: wetness.	Poor: too clayey, small stones.
10E---------------- Killarney	Severe: wetness, percs slowly, slope.	Severe: slope, large stones.	Severe: slope, large stones.	Severe: slope.	Poor: small stones, slope.
11C---------------- Lebanon	Severe: wetness, percs slowly.	Moderate: slope.	Severe: wetness, too clayey.	Severe: wetness.	Poor: too clayey, hard to pack, small stones.

TABLE 12.--SANITARY FACILITIES--Continued

Soil name and map symbol	Septic tank absorption fields	Sewage lagoon areas	Trench sanitary landfill	Area sanitary landfill	Daily cover for landfill
12E Goss	Severe: slope.	Severe: seepage, slope, large stones.	Severe: slope, too clayey, large stones.	Severe: slope.	Poor: too clayey, small stones, slope.
13F Clarksville	Severe: slope.	Severe: seepage, slope.	Severe: slope.	Severe: seepage, slope.	Poor: small stones, slope.
18C Courtois	Moderate: percs slowly.	Moderate: seepage, slope.	Severe: too clayey.	Slight	Poor: too clayey, hard to pack.
18D Courtois	Moderate: percs slowly, slope.	Severe: slope.	Severe: too clayey.	Moderate: slope.	Poor: too clayey, hard to pack.
19B Crider	Slight	Moderate: seepage, slope.	Moderate: too clayey.	Slight	Fair: too clayey.
19C Crider	Moderate: slope.	Severe: slope.	Moderate: slope, too clayey.	Moderate: slope.	Fair: too clayey, slope.
20B Fourche	Severe: wetness, percs slowly.	Severe: wetness.	Severe: wetness, too clayey.	Moderate: wetness.	Poor: too clayey, hard to pack.
20C Fourche	Severe: wetness, percs slowly.	Severe: slope, wetness.	Severe: wetness, too clayey.	Moderate: wetness.	Poor: too clayey, hard to pack.
22D Wilderness	Severe: wetness, percs slowly.	Severe: slope.	Severe: wetness, too clayey.	Severe: wetness.	Poor: too clayey, small stones.
22E Wilderness	Severe: wetness, percs slowly, slope.	Severe: slope.	Severe: wetness, slope, too clayey.	Severe: wetness, slope.	Poor: too clayey, small stones, slope.
25A Auxvasse	Severe: wetness, percs slowly.	Severe: wetness.	Severe: wetness.	Severe: wetness.	Poor: wetness.
31A Loughboro	Severe: wetness, percs slowly.	Slight	Severe: wetness, too clayey.	Severe: wetness.	Poor: too clayey, hard to pack, wetness.
35C Viburnum	Severe: wetness, percs slowly.	Severe: slope, wetness.	Severe: wetness, too clayey.	Moderate: wetness.	Poor: too clayey, small stones.
36B Lowell	Severe: wetness, percs slowly.	Severe: wetness.	Severe: depth to rock, too clayey.	Moderate: depth to rock, wetness.	Poor: too clayey, hard to pack.
41D Gasconade	Severe: thin layer, seepage.	Severe: depth to rock, seepage, slope.	Severe: depth to rock, seepage.	Severe: seepage.	Poor: area reclaim, too clayey, large stones.

TABLE 12.--SANITARY FACILITIES--Continued

Soil name and map symbol	Septic tank absorption fields	Sewage lagoon areas	Trench sanitary landfill	Area sanitary landfill	Daily cover for landfill
42F----------------- Irondale	Severe: depth to rock, slope.	Severe: depth to rock, slope, large stones.	Severe: depth to rock, slope, large stones.	Severe: depth to rock, slope.	Poor: depth to rock, small stones, slope.
43E----------------- Syenite	Severe: thin layer, seepage, slope.	Severe: depth to rock, seepage, slope.	Severe: depth to rock, seepage, slope.	Severe: slope.	Poor: area reclaim, slope, thin layer.
45F:					
Taumsauk-----------	Severe: thin layer, seepage, slope.	Severe: depth to rock, seepage, slope.	Severe: depth to rock, seepage, slope.	Severe: seepage, slope.	Poor: area reclaim, slope, thin layer.
Irondale-----------	Severe: depth to rock, slope.	Severe: depth to rock, slope, large stones.	Severe: depth to rock, slope, large stones.	Severe: depth to rock, slope.	Poor: depth to rock, small stones, slope.
Rock outcrop.					
52B----------------- Secesh	Moderate: flooding, percs slowly.	Severe: seepage.	Severe: seepage.	Severe: seepage.	Poor: small stones.
67------------------ Wakeland	Severe: flooding, wetness.	Severe: flooding, wetness.	Severe: flooding, wetness.	Severe: flooding, wetness.	Poor: wetness.
80B----------------- Bloomsdale	Severe: flooding.	Severe: seepage, flooding.	Severe: flooding, too clayey.	Severe: flooding, seepage.	Poor: too clayey, small stones.
81A----------------- Midco	Severe: flooding.	Severe: seepage, flooding.	Severe: flooding, seepage, too sandy.	Severe: flooding, seepage.	Poor: seepage, too sandy, small stones.
82A----------------- Dameron	Severe: flooding, percs slowly.	Severe: flooding.	Severe: flooding, too clayey.	Severe: flooding.	Poor: too clayey, small stones.
91. Udipsamments					
94. Pits and dumps					

TABLE 13.--CONSTRUCTION MATERIALS

(Some terms that describe restrictive soil features are defined in the Glossary. See text for definitions of "good," "fair," and other terms. Absence of an entry indicates that the soil was not rated. The information in this table indicates the dominant soil condition but does not eliminate the need for onsite investigation)

Soil name and map symbol	Roadfill	Sand	Gravel	Topsoil
1C-------------------- Lamotte	Poor: low strength.	Improbable: excess fines.	Improbable: excess fines.	Fair: too clayey.
2B, 2C, 2D------------ Gatewood	Poor: area reclaim, shrink-swell, low strength.	Improbable: excess fines.	Improbable: excess fines.	Poor: too clayey, small stones.
2E-------------------- Gatewood	Poor: area reclaim, shrink-swell, low strength.	Improbable: excess fines.	Improbable: excess fines.	Poor: too clayey, large stones, slope.
4C-------------------- Knobtop	Poor: area reclaim, low strength.	Improbable: excess fines.	Improbable: excess fines.	Fair: area reclaim, small stones, thin layer.
4D-------------------- Knobtop	Poor: area reclaim, thin layer.	Improbable: excess fines.	Improbable: excess fines.	Fair: area reclaim, large stones.
6C-------------------- Delassus	Poor: low strength.	Improbable: excess fines.	Improbable: excess fines.	Poor: area reclaim.
6D-------------------- Delassus	Poor: low strength.	Improbable: excess fines.	Improbable: excess fines.	Poor: large stones, area reclaim.
9C-------------------- Viraton	Fair: shrink-swell, wetness.	Improbable: excess fines.	Improbable: excess fines.	Poor: small stones, area reclaim.
10E------------------- Killarney	Poor: large stones, slope.	Improbable: excess fines.	Improbable: excess fines.	Poor: large stones, area reclaim, slope.
11C------------------- Lebanon	Poor: low strength.	Improbable: excess fines.	Improbable: excess fines.	Poor: too clayey, small stones, area reclaim.
12E------------------- Goss	Fair: shrink-swell, thin layer, slope.	Improbable: excess fines.	Improbable: excess fines.	Poor: small stones, area reclaim, slope.
13F------------------- Clarksville	Poor: slope.	Improbable: excess fines.	Improbable: excess fines.	Poor: small stones, area reclaim, slope.
18C, 18D-------------- Courtois	Poor: low strength.	Improbable: excess fines.	Improbable: excess fines.	Poor: too clayey, small stones.

TABLE 13.--CONSTRUCTION MATERIALS--Continued

Soil name and map symbol	Roadfill	Sand	Gravel	Topsoil
19B Crider	Poor: low strength.	Improbable: excess fines.	Improbable: excess fines.	Fair: too clayey.
19C Crider	Poor: low strength.	Improbable: excess fines.	Improbable: excess fines.	Fair: too clayey, slope.
20B, 20C Fourche	Poor: low strength.	Improbable: excess fines.	Improbable: excess fines.	Fair: small stones, area reclaim, thin layer.
22D Wilderness	Fair: large stones, shrink-swell.	Improbable: excess fines.	Improbable: excess fines.	Poor: area reclaim, small stones.
22E Wilderness	Fair: shrink-swell, large stones, slope.	Improbable: excess fines.	Improbable: excess fines.	Poor: area reclaim, small stones, slope.
25A Auxvasse	Poor: low strength.	Improbable: excess fines.	Improbable: excess fines.	Poor: thin layer.
31A Loughboro	Poor: low strength.	Improbable: excess fines.	Improbable: excess fines.	Poor: thin layer.
35C Viburnum	Poor: shrink-swell.	Improbable: excess fines.	Improbable: excess fines.	Poor: too clayey, small stones, area reclaim.
36B Lowell	Poor: low strength.	Improbable: excess fines.	Improbable: excess fines.	Poor: area reclaim.
41D Gasconade	Poor: area reclaim, large stones, thin layer.	Improbable: excess fines, large stones.	Improbable: excess fines, large stones.	Poor: area reclaim, large stones, thin layer.
42F Irondale	Poor: depth to rock, slope.	Improbable: excess fines.	Improbable: excess fines.	Poor: small stones, slope.
43E Syenite	Poor: area reclaim, low strength.	Improbable: excess fines.	Improbable: excess fines.	Poor: small stones, slope.
45F:				
Taumsauk	Poor: area reclaim, thin layer, slope.	Improbable: excess fines.	Improbable: excess fines.	Poor: area reclaim, large stones, slope.
Irondale	Poor: depth to rock, slope.	Improbable: excess fines.	Improbable: excess fines.	Poor: small stones, slope.
Rock outcrop.				

TABLE 13.--CONSTRUCTION MATERIALS--Continued

Soil name and map symbol	Roadfill	Sand	Gravel	Topsoil
52B Secesh	Good	Improbable: excess fines.	Improbable: excess fines.	Poor: too clayey, small stones, area reclaim.
67 Wakeland	Fair: low strength, wetness.	Improbable: excess fines.	Improbable: excess fines.	Good.
80B Bloomsdale	Fair: shrink-swell, large stones.	Improbable: excess fines.	Improbable: excess fines.	Poor: small stones, area reclaim.
81A Midco	Good	Probable	Probable	Poor: small stones, area reclaim.
82A Dameron	Fair: shrink-swell.	Improbable: excess fines.	Improbable: excess fines.	Poor: small stones, area reclaim.
91. Udipsamments				
94. Pits and dumps				

TABLE 14.--WATER MANAGEMENT

(Some terms that describe restrictive soil features are defined in the Glossary. See text for definitions of "slight," "moderate," and "severe." Absence of an entry indicates that the soil was not evaluated. The information in this table indicates the dominant soil condition but does not eliminate the need for onsite investigation)

Soil name and map symbol	Limitations for--		Features affecting--			
	Pond reservoir areas	Embankments, dikes, and levees	Drainage	Irrigation	Terraces and diversions	Grassed waterways
1C----------------- Lamotte	Moderate: seepage, slope.	Moderate: thin layer.	Deep to water	Slope-----------	Favorable------	Favorable.
2B, 2C----------- Gatewood	Moderate: depth to rock, seepage, slope.	Severe: hard to pack.	Deep to water	Slope, percs slowly.	Depth to rock, area reclaim.	Depth to rock, area reclaim.
2D----------------- Gatewood	Severe: slope.	Severe: hard to pack.	Deep to water	Slope, percs slowly.	Depth to rock, slope, area reclaim.	Depth to rock, slope, area reclaim.
2E----------------- Gatewood	Severe: depth to rock, seepage, slope.	Severe: hard to pack.	Deep to water	Slope, droughty, percs slowly.	Slope, depth to rock, area reclaim.	Slope, large stones, depth to rock.
4C----------------- Knobtop	Severe: slope.	Severe: thin layer.	Thin layer, frost action, slope.	Slope, wetness, thin layer.	Slope, depth to rock, area reclaim.	Slope, erodes easily, depth to rock.
4D----------------- Knobtop	Moderate: depth to rock, seepage, slope.	Severe: thin layer.	Slope, thin layer, frost action.	Slope, wetness, large stones.	Depth to rock, area reclaim.	Erodes easily, depth to rock.
6C----------------- Delassus	Moderate: seepage, depth to rock, slope.	Moderate: thin layer, wetness.	Percs slowly, slope.	Slope, wetness, percs slowly.	Erodes easily, wetness.	Erodes easily, rooting depth.
6D----------------- Delassus	Severe: slope.	Moderate: thin layer, large stones, wetness.	Percs slowly, slope, large stones.	Slope, wetness, droughty.	Slope, large stones, erodes easily.	Large stones, slope, erodes easily.
9C----------------- Viraton	Moderate: seepage, slope.	Moderate: piping, wetness.	Percs slowly, slope.	Slope, wetness, droughty.	Erodes easily, wetness.	Erodes easily, droughty.
10E---------------- Killarney	Severe: slope.	Severe: large stones.	Percs slowly, slope.	Slope, large stones, wetness.	Slope, large stones, wetness.	Large stones, slope, droughty.
11C---------------- Lebanon	Moderate: slope.	Severe: hard to pack.	Percs slowly, slope.	Slope, wetness, droughty.	Erodes easily, wetness.	Wetness, erodes easily.
12E---------------- Goss	Severe: slope.	Severe: large stones.	Deep to water	Large stones, droughty, slope.	Slope, large stones.	Large stones, slope, droughty.
13F---------------- Clarksville	Severe: seepage, slope.	Moderate: large stones.	Deep to water	Droughty, slope.	Slope, large stones.	Large stones, slope, droughty.

TABLE 14.--WATER MANAGEMENT--Continued

Soil name and map symbol	Limitations for--		Features affecting--			
	Pond reservoir areas	Embankments, dikes, and levees	Drainage	Irrigation	Terraces and diversions	Grassed waterways
18C-------------- Courtois	Moderate: seepage, slope.	Severe: hard to pack.	Deep to water	Slope, erodes easily.	Erodes easily	Erodes easily.
18D-------------- Courtois	Severe: slope.	Severe: hard to pack.	Deep to water	Slope, erodes easily.	Slope, erodes easily.	Slope, erodes easily.
19B-------------- Crider	Moderate: seepage.	Severe: piping.	Deep to water	Slope----------	Favorable------	Favorable.
19C-------------- Crider	Moderate: seepage.	Severe: piping.	Deep to water	Slope----------	Slope----------	Slope.
20B, 20C---------- Fourche	Moderate: slope.	Moderate: hard to pack, wetness.	Slope----------	Wetness, slope, erodes easily.	Erodes easily, wetness.	Erodes easily.
22D, 22E---------- Wilderness	Severe: slope.	Moderate: large stones, wetness.	Large stones, slope, percs slowly.	Slope, large stones, wetness.	Slope, large stones, wetness.	Large stones, wetness, slope.
25A-------------- Auxvasse	Slight---------	Moderate: wetness.	Percs slowly---	Wetness, percs slowly, erodes easily.	Erodes easily, wetness.	Wetness, erodes easily, percs slowly.
31A-------------- Loughboro	Slight---------	Moderate: hard to pack, wetness.	Percs slowly, frost action.	Wetness, percs slowly, erodes easily.	Erodes easily, wetness, percs slowly.	Wetness, erodes easily, percs slowly.
35C-------------- Viburnum	Moderate: seepage, slope.	Moderate: wetness.	Slope----------	Slope, wetness.	Erodes easily, wetness.	Erodes easily.
36B-------------- Lowell	Moderate: seepage, depth to rock, slope.	Severe: hard to pack.	Slope----------	Wetness, slope, erodes easily.	Erodes easily, wetness.	Erodes easily.
41D-------------- Gasconade	Severe: depth to rock, seepage, slope.	Severe: large stones, thin layer.	Deep to water	Slope, large stones, droughty.	Slope, large stones, depth to rock.	Large stones, slope, droughty.
42F-------------- Irondale	Severe: slope.	Severe: large stones.	Deep to water	Slope, large stones, droughty.	Slope, large stones, depth to rock.	Large stones, slope, droughty.
43E-------------- Syenite	Severe: slope.	Severe: thin layer.	Deep to water	Slope, thin layer.	Slope, depth to rock, area reclaim.	Slope, depth to rock, area reclaim.
45F:						
Taumsauk---------	Severe: depth to rock, seepage, slope.	Severe: large stones.	Deep to water	Slope, large stones, droughty.	Slope, large stones, depth to rock.	Slope, large stones, droughty.
Irondale---------	Severe: slope.	Severe: large stones.	Deep to water	Slope, large stones, droughty.	Slope, large stones, depth to rock.	Large stones, slope, droughty.
Rock outcrop.						

TABLE 14.--WATER MANAGEMENT--Continued

Soil name and map symbol	Limitations for-- Pond reservoir areas	Limitations for-- Embankments, dikes, and levees	Features affecting-- Drainage	Features affecting-- Irrigation	Features affecting-- Terraces and diversions	Features affecting-- Grassed waterways
52B: Secesh	Severe: seepage.	Slight	Deep to water	Favorable	Favorable	Favorable.
67: Wakeland	Moderate: seepage.	Severe: piping, wetness.	Flooding, frost action.	Wetness, erodes easily, flooding.	Erodes easily, wetness.	Wetness, erodes easily.
80B: Bloomsdale	Severe: seepage.	Moderate: large stones.	Deep to water	Large stones, droughty.	Large stones	Large stones, droughty.
81A: Midco	Severe: seepage.	Severe: seepage.	Deep to water	Droughty	Large stones, too sandy.	Large stones, droughty.
82A: Dameron	Moderate: seepage.	Slight	Deep to water	Flooding	Favorable	Favorable.
91. Udipsamments						
94. Pits and dumps						

TABLE 15.--ENGINEERING INDEX PROPERTIES

(The symbol < means less than; > means more than. Absence of an entry indicates that data were not estimated)

Soil name and map symbol	Depth	USDA texture	Classification		Fragments >3 inches	Percentage passing sieve number--				Liquid limit	Plasticity index
			Unified	AASHTO		4	10	40	200		
	In				Pct					Pct	
1C--------------- Lamotte	0-8	Silt loam--------	CL-ML, CL	A-4, A-6	0	100	100	80-100	60-90	20-32	5-11
	8-62	Clay loam, loam, silty clay loam.	CL, SC	A-6, A-7	0	90-100	75-100	80-95	40-80	30-50	15-30
2B, 2C, 2D------- Gatewood	0-6	Silt loam--------	CL	A-4, A-6	0-10	85-100	80-100	70-100	65-90	25-35	7-15
	6-29	Cherty silty clay, cherty clay, clay.	CH	A-7	0-10	80-95	60-90	55-90	50-85	55-75	30-45
	29	Unweathered bedrock.	---	---	---	---	---	---	---	---	---
2E--------------- Gatewood	0-4	Silt loam--------	CL, CL-ML	A-4, A-6	5-30	90-100	85-100	75-100	60-95	20-35	5-15
	4-24	Cherty silty clay, cherty clay, clay.	CH, SC	A-7	5-30	80-95	50-90	40-85	40-85	55-75	30-45
	24	Unweathered bedrock.	---	---	---	---	---	---	---	---	---
4C--------------- Knobtop	0-7	Silt loam--------	CL-ML, CL	A-4, A-6	0-5	95-100	95-100	90-100	85-100	20-35	5-15
	7-30	Silty clay loam, silt loam.	CL	A-6, A-7	0-5	95-100	90-100	90-100	85-100	35-45	15-22
	30-36	Silty clay loam, silt loam, gravelly silt loam.	CL	A-6	0-5	85-100	60-90	60-90	60-85	30-40	10-18
	36	Unweathered bedrock.	---	---	---	---	---	---	---	---	---
4D--------------- Knobtop	0-6	Silt loam--------	CL-ML, CL	A-4, A-6	5-20	95-100	95-100	90-100	85-100	20-35	5-15
	6-24	Silty clay loam, silt loam, clay loam.	CL	A-6	5-10	85-100	80-100	70-90	65-85	30-40	11-18
	24-32	Very cobbly silt loam, cobbly silt loam, cobbly clay loam.	CL	A-4, A-6	10-50	80-90	75-90	65-80	55-70	25-40	8-18
	32	Unweathered bedrock.	---	---	---	---	---	---	---	---	---
6C--------------- Delassus	0-6	Silt loam--------	CL-ML, CL, ML	A-4, A-6	0-15	95-100	90-100	80-90	65-75	21-35	4-15
	6-29	Silt loam, silty clay loam, clay loam.	CL	A-6, A-7	0-15	95-100	90-100	85-95	70-85	35-45	15-21
	29-65	Silt loam, loam, sandy loam.	CL	A-4, A-6	0-15	95-100	90-100	70-85	50-75	25-35	7-15
6D--------------- Delassus	0-11	Silt loam--------	CL-ML, CL	A-4, A-6	15-30	90-100	85-100	75-90	65-75	21-35	4-15
	11-25	Silt loam, silty clay loam, clay loam.	CL	A-6, A-7	15-30	90-100	85-100	80-95	70-85	35-45	15-21
	25-50	Gravelly silt loam, gravelly silty clay loam.	GC, SC	A-2, A-4, A-6	0-15	50-80	50-75	40-65	30-50	25-35	7-15
	50	Unweathered bedrock.	---	---	---	---	---	---	---	---	---

TABLE 15.--ENGINEERING INDEX PROPERTIES--Continued

Soil name and map symbol	Depth	USDA texture	Classification: Unified	Classification: AASHTO	Fragments >3 inches	Percentage passing sieve number-- 4	10	40	200	Liquid limit	Plasticity index
	In				Pct					Pct	
9C-------------- Viraton	0-8	Silt loam--------	CL, CL-ML	A-4, A-6	0	95-100	90-100	70-95	60-75	20-30	5-11
	8-31	Silt loam, silty clay loam.	CL, GC, SC	A-4, A-6	0-5	95-100	90-100	50-95	45-75	25-35	8-15
	31-59	Very cherty silt loam, very cherty silty clay loam.	GC, CL, SC	A-2, A-4, A-6	0-15	25-70	20-70	20-65	20-55	25-35	8-15
	59-71	Very cherty silty clay, cherty silty clay, cherty clay.	GC, CL, SC	A-2, A-6, A-7	0-10	40-90	20-90	35-85	30-75	30-50	11-25
10E-------------- Killarney	0-3	Very cobbly silt loam.	CL-ML, CL	A-4	30-50	65-90	65-85	55-75	50-70	20-30	5-10
	3-12	Very cobbly silt loam.	CL-ML, CL	A-4, A-6	40-60	70-95	70-90	60-80	55-75	20-35	5-15
	12-31	Very cobbly silty clay loam, very cobbly silt loam.	CL	A-6	40-60	75-95	75-90	60-85	55-80	32-40	15-22
	31-36	Very gravelly silty clay loam, very gravelly silt loam.	GC	A-6, A-2-6	30-45	40-65	40-60	35-55	30-50	25-30	11-16
	36-57	Very gravelly silt loam, very gravelly loam, very gravelly clay loam.	GC, GM-GC	A-2, A-4, A-6, A-1-b	5-20	30-50	25-45	20-40	15-40	20-35	5-15
	57-80	Gravelly silt loam, gravelly loam, gravelly clay loam.	GC, CL-ML, CL, SC	A-2, A-4, A-6	5-20	55-80	50-75	45-70	30-60	20-35	5-15
11C-------------- Lebanon	0-5	Silt loam--------	CL-ML, CL	A-4, A-6	0-5	85-100	85-100	80-95	60-75	22-35	5-15
	5-8	Silt loam, silty clay loam.	CL	A-6	0-5	85-95	80-95	75-95	60-75	30-40	11-20
	8-25	Silty clay loam, silty clay.	CL	A-7	0-5	85-95	70-95	65-90	55-75	40-50	20-30
	25-37	Extremely cherty silt loam, silty clay loam, silt loam.	CL, SC, GC	A-7, A-2, A-6	0-10	55-90	30-85	25-80	20-65	35-45	15-20
	37-45	Cherty silty clay loam, very cherty silty clay loam.	CL, GC	A-2, A-6, A-7	0-10	55-75	30-75	25-70	20-55	35-45	15-20
	45-60	Cherty silty clay, clay, silty clay.	CL, CH, SC, GC	A-7, A-2-7	0-10	65-95	30-90	25-90	20-85	45-80	25-45
12E-------------- Goss	0-2	Very cherty silt loam.	GM, GC, GM-GC	A-2	10-40	40-60	35-55	30-50	25-35	20-30	2-10
	2-9	Very cherty silty clay loam, very cherty silt loam.	GM, GC, GM-GC	A-2	10-40	40-60	35-55	30-50	25-35	20-30	2-10
	9-79	Cherty silty clay loam, very cherty silty clay, very cherty clay.	GC, SC	A-7, A-2-7	10-45	45-70	20-65	20-50	20-45	50-70	30-40

TABLE 15.--ENGINEERING INDEX PROPERTIES--Continued

Soil name and map symbol	Depth	USDA texture	Classification		Frag- ments >3 inches	Percentage passing sieve number--				Liquid limit	Plas- ticity index
			Unified	AASHTO		4	10	40	200		
	In				Pct					Pct	
13F-------------- Clarksville	0-16	Very cherty silt loam.	GC, SC, SM-SC, GP-GC	A-2-4, A-2-6, A-1-a	5-30	30-70	10-60	5-50	5-35	20-40	5-15
	16-58	Very cherty silt loam, very cherty silty clay loam.	GC, SC, SP-SC, GP-GC	A-2-6, A-6	5-20	30-70	10-60	10-50	5-45	30-40	15-25
	58-68	Very cherty silty clay, very cherty clay, extremely cherty silty clay.	GC, SC, GP-GC, SP-SC	A-7, A-2-7	5-20	30-70	20-60	10-50	10-45	55-75	35-55
18C, 18D--------- Courtois	0-10	Silt loam--------	CL-ML, CL, ML	A-4	0-5	95-100	75-100	75-95	55-90	25-35	5-10
	10-17	Silty clay loam, silty clay.	CL	A-6, A-7	0-5	95-100	90-100	85-100	80-95	35-50	15-30
	17-28	Very cherty clay, cherty clay, very cherty silty clay.	CL, CH, GC, SC	A-7	5-30	50-80	40-70	35-70	35-70	40-60	25-45
	28-60	Clay, cherty clay	CH	A-7	0-10	75-95	70-100	60-90	50-80	50-70	30-45
19B, 19C--------- Crider	0-7	Silt loam--------	ML, CL, CL-ML	A-4, A-6	0	100	95-100	90-100	85-100	25-35	3-12
	7-33	Silt loam, silty clay loam.	CL, ML, CL-ML	A-7, A-6, A-4	0	100	95-100	90-100	85-100	25-42	3-20
	33-72	Silty clay, clay, silty clay loam.	CL, CH	A-7, A-6	0-5	85-100	80-100	70-100	60-100	35-65	15-40
20B, 20C--------- Fourche	0-14	Silt loam--------	CL, CL-ML	A-4, A-6	0	100	95-100	90-100	85-95	25-35	5-15
	14-34	Silty clay loam	CL	A-7, A-6	0	100	95-100	90-100	85-95	35-45	15-25
	34-65	Silty clay, clay, silty clay loam.	CL, CH	A-7	0-5	85-100	75-100	70-100	60-95	40-60	25-40
22D, 22E--------- Wilderness	0-16	Very cherty silt loam.	SM-SC, SC, SP-SC, GC	A-1, A-4, A-2-4	0-10	60-85	50-75	20-50	10-40	20-30	5-10
	16-22	Very cherty silty clay loam, extremely cherty silty clay loam.	GC, GP-GC, SC, SP-SC	A-6, A-2-6	5-15	40-70	20-60	10-50	10-40	25-40	10-20
	22-33	Very cherty silt loam, very cherty silty clay loam.	GM-GC, GC, GP-GC	A-1, A-2-4, A-2-6	10-40	30-60	10-45	10-40	5-35	20-40	5-15
	33-75	Very cherty silty clay, very cherty clay, extremely cherty silty clay.	GC, GP-GC	A-2-6	10-40	30-60	10-45	10-40	5-35	25-40	15-25
25A-------------- Auxvasse	0-16	Silt loam--------	CL-ML, CL	A-4, A-6	0	100	100	90-100	85-100	25-35	5-15
	16-33	Silty clay, clay	CH	A-7	0	100	100	95-100	90-100	50-65	30-40
	33-60	Silty clay loam, silt loam.	CL	A-6, A-7	0	100	100	90-100	90-96	35-45	20-25
31A-------------- Loughboro	0-11	Silt loam--------	CL	A-6	0	100	100	90-100	80-90	28-35	10-15
	11-28	Silty clay loam, silty clay, clay.	CH	A-7	0-5	95-100	95-100	90-100	85-90	50-65	30-40
	28-60	Silt loam, loam, silty clay loam.	CL	A-7	0-5	90-100	85-100	80-90	60-85	40-50	20-28

TABLE 15.--ENGINEERING INDEX PROPERTIES--Continued

Soil name and map symbol	Depth	USDA texture	Classification: Unified	Classification: AASHTO	Fragments >3 inches	Percentage passing sieve number--: 4	10	40	200	Liquid limit	Plasticity index
	In				Pct					Pct	
35C--------------- Viburnum	0-7	Silt loam--------	CL-ML, CL	A-4	0	90-100	80-100	75-95	60-90	20-30	5-10
	7-20	Silty clay loam, cherty silty clay loam.	CL	A-6, A-7	0-5	70-100	60-100	55-90	55-85	35-50	15-25
	20-38	Silty clay loam, silty clay, very cherty silty clay.	GC, SC, CL, CH	A-7, A-2-7	0-10	50-85	40-75	35-70	30-65	45-60	20-35
	38-60	Cherty silty clay, cherty clay, extremely cherty clay.	SC, GC, GP-GC, SP-SC	A-2-7	0-10	20-75	10-60	10-40	5-35	45-70	20-40
36B--------------- Lowell	0-10	Silt loam--------	CL, CL-ML	A-4	0	100	95-100	85-100	70-90	22-32	4-10
	10-14	Silty clay loam	CL	A-6, A-7	0-2	95-100	95-100	90-100	80-95	34-42	15-22
	14-57	Silty clay, clay	CH, CL	A-7, A-6	0-5	95-100	90-100	80-100	75-95	35-65	15-45
	57	Unweathered bedrock.	---	---	---	---	---	---	---	---	---
41D--------------- Gasconade	0-6	Flaggy silty clay loam.	CL	A-6	50-80	75-90	70-85	60-75	55-65	30-40	15-25
	6-18	Very flaggy silty clay loam, very flaggy clay, very flaggy silty clay.	GC	A-2-7	20-70	45-55	40-50	30-40	20-35	55-65	35-45
	18	Unweathered bedrock.	---	---	---	---	---	---	---	---	---
42F--------------- Irondale	0-8	Very cobbly silt loam.	GM-GC, GC	A-4, A-2-4	10-25	40-65	40-60	35-55	30-50	20-33	4-10
	8-23	Very cobbly silt loam, very cobbly silty clay loam.	GM-GC, GC	A-4, A-6, A-2	25-40	30-55	30-50	30-50	25-45	25-40	5-18
	23-35	Very cobbly silt loam, very cobbly clay loam, very cobbly loam.	GM-GC, GC	A-4, A-6, A-2	25-40	30-55	30-50	30-50	25-45	20-40	4-18
	35	Unweathered bedrock.	---	---	---	---	---	---	---	---	---
43E--------------- Syenite	0-6	Silt loam--------	CL-ML, CL	A-4, A-6	3-25	90-100	85-100	70-90	60-85	25-35	5-15
	6-19	Silt loam, silty clay loam.	CL	A-6, A-7	0-5	90-100	90-100	80-90	70-80	35-45	15-22
	19-25	Loam, sandy clay loam, clay loam.	SC, CL	A-4, A-6	0-5	85-95	75-90	60-85	35-60	25-35	7-15
	25-31	Gravelly loam, gravelly clay loam, gravelly sandy clay loam.	SC	A-6, A-7, A-2-6, A-2-7	0-5	75-85	55-75	45-60	20-45	35-45	15-25
	31	Unweathered bedrock.	---	---	---	---	---	---	---	---	---

TABLE 15.--ENGINEERING INDEX PROPERTIES--Continued

Soil name and map symbol	Depth	USDA texture	Classification		Fragments >3 inches	Percentage passing sieve number--				Liquid limit	Plasticity index
			Unified	AASHTO		4	10	40	200		
	In				Pct					Pct	
45F:											
Taumsauk	0-6	Very cobbly silt loam.	CL, CL-ML, GC, GM-GC	A-4	25-45	60-75	55-75	45-75	35-70	15-25	4-10
	6-11	Very cobbly silt loam, very gravelly silt loam.	CL, CL-ML, GC, GM-GC	A-4, A-6	15-40	55-75	50-75	45-75	35-70	20-40	5-15
	11-16	Very cobbly silt loam, very cobbly silty clay loam.	CL, GC, SC	A-6	15-40	55-75	50-75	45-75	40-70	25-35	11-20
	16	Unweathered bedrock.	---	---	---	---	---	---	---	---	---
Irondale	0-9	Silt loam	GM-GC, GC	A-4, A-2-4	10-25	40-65	40-60	35-55	30-50	20-33	4-10
	9-33	Very cobbly silt loam, very cobbly silty clay loam.	GM-GC, GC	A-4, A-6, A-2	25-40	30-55	30-50	30-50	25-45	25-40	5-18
	33	Unweathered bedrock.	---	---	---	---	---	---	---	---	---
Rock outcrop.											
52B Secesh	0-7	Silt loam	ML	A-4	0-10	85-100	80-100	75-95	60-90	20-30	NP-7
	7-30	Silty clay loam, silt loam.	CL, CL-ML	A-4, A-6	0-10	80-100	75-100	70-95	60-90	25-35	5-12
	30-60	Extremely cherty sandy clay, very cherty clay loam, extremely cherty clay loam.	GC, SC, GP-GC, SP-SC	A-6, A-2-6	15-45	40-70	25-65	20-45	10-40	30-40	11-20
67 Wakeland	0-5	Silt loam	ML	A-4	0	100	100	90-100	80-90	27-36	4-10
	5-60	Silt loam	ML	A-4	0	100	100	90-100	80-90	27-36	4-10
80B Bloomsdale	0-8	Very gravelly loam.	GP-GM, GM, GM-GC	A-4, A-2-4, A-1	5-20	35-55	30-50	15-45	10-40	<25	2-7
	8-24	Gravelly loam, very gravelly loam, very gravelly sandy loam.	SM, SM-SC, GM, GM-GC	A-4, A-2-4, A-1-b	5-20	60-80	45-75	30-70	15-45	<25	2-7
	24-60	Extremely cobbly clay, very cobbly clay, very cobbly clay loam.	GC, SC, GP-GC, SP-SC	A-2-7	10-40	40-70	15-30	15-30	10-30	40-70	20-40
81A Midco	0-7	Cherty loam	CL, CL-ML, ML	A-4	0-5	50-100	35-75	60-70	50-70	20-30	2-10
	7-40	Extremely cherty loam, very cherty loam, extremely cherty sandy loam.	SM, SM-SC, GM, GM-GC	A-2-4, A-1-b	5-25	35-70	20-65	20-60	20-35	<25	2-7
	40-60	Stratified cherty loam to extremely cherty sand.	GM, GP-GM, GM-GC, SM	A-1, A-2-4	5-30	15-70	10-60	10-50	5-30	<25	NP-5

TABLE 15.--ENGINEERING INDEX PROPERTIES--Continued

Soil name and map symbol	Depth	USDA texture	Classification		Fragments >3 inches	Percentage passing sieve number--				Liquid limit	Plasticity index
			Unified	AASHTO		4	10	40	200		
	In				Pct					Pct	
82A--------------- Dameron	0-23	Silt loam---------	CL	A-6	0-10	95-100	90-100	85-100	80-95	25-40	10-20
	23-29	Silty clay loam	CL	A-6	0-15	95-100	90-100	80-100	70-95	30-40	15-25
	29-36	Very cherty silty clay loam.	GC, SC	A-2-6, A-6	5-25	35-55	25-50	25-50	20-45	30-40	15-25
	36-44	Cherty clay, cherty clay loam.	GC, CL, CH, SC	A-7	5-25	55-75	50-75	45-70	35-60	40-70	20-40
	44-60	Very cherty clay, very cherty clay loam.	GC, SC, GP-GC, SP-SC	A-2-7	10-40	40-70	15-30	15-30	10-30	40-70	20-40
91. Udipsamments											
94. Pits and dumps											

TABLE 16.--PHYSICAL AND CHEMICAL PROPERTIES OF THE SOILS

(The symbol < means less than; > means more than. Entries under "Erosion factors--T" apply to the entire profile. Entries under "Organic matter" apply only to the surface layer. Absence of an entry indicates that data were not available or were not estimated)

Soil name and map symbol	Depth	Clay	Moist bulk density	Permeability	Available water capacity	Soil reaction	Shrink-swell potential	Erosion factors K	Erosion factors T	Organic matter
	In	Pct	g/cc	In/hr	In/in	pH				Pct
1C---------------- Lamotte	0-8	10-20	1.20-1.40	0.6-2.0	0.18-0.22	4.5-7.3	Low-----------	0.32	5	.5-1
	8-62	25-35	1.40-1.60	0.2-0.6	0.15-0.20	3.6-6.5	Moderate-----	0.32		
2B, 2C, 2D------- Gatewood	0-6	15-25	1.10-1.40	0.6-2.0	0.20-0.22	5.1-7.3	Low-----------	0.43	3	.5-2
	6-29	60-85	1.10-1.30	0.06-0.2	0.09-0.12	5.1-7.3	High----------	0.32		
	29	---	---	---	---	---	--------------	----		
2E--------------- Gatewood	0-4	15-25	1.10-1.40	0.6-2.0	0.14-0.20	5.6-7.3	Low-----------	0.28	3	.5-2
	4-24	60-85	1.35-1.60	0.06-0.2	0.05-0.14	5.6-7.3	High----------	0.28		
	24	---	---	---	---	---	--------------	----		
4C--------------- Knobtop	0-7	12-25	1.30-1.50	0.6-2.0	0.20-0.24	4.5-5.5	Low-----------	0.37	4	.5-1
	7-30	25-35	1.40-1.60	0.2-0.6	0.12-0.18	3.6-5.5	Moderate-----	0.37		
	30-36	20-30	1.40-1.60	0.2-0.6	0.12-0.18	3.6-5.0	Low-----------	0.37		
	36	---	---	---	---	---	--------------	----		
4D--------------- Knobtop	0-6	12-25	1.30-1.50	0.6-2.0	0.16-0.22	4.5-5.5	Low-----------	0.28	4	.5-1
	6-24	25-35	1.40-1.60	0.2-0.6	0.10-0.16	3.6-5.5	Moderate-----	0.37		
	24-32	20-35	1.40-1.60	0.2-0.6	0.08-0.12	3.6-5.0	Moderate-----	0.28		
	32	---	---	---	---	---	--------------	----		
6C--------------- Delassus	0-6	10-25	1.20-1.40	0.6-2.0	0.20-0.24	5.6-7.3	Low-----------	0.37	4	.5-2
	6-29	24-35	1.30-1.50	0.6-2.0	0.12-0.18	3.6-6.0	Moderate-----	0.37		
	29-65	15-25	1.60-1.80	<0.06	0.01-0.10	3.6-5.0	Low-----------	0.37		
6D--------------- Delassus	0-11	10-25	1.20-1.40	0.6-2.0	0.18-0.22	5.6-7.3	Low-----------	0.37	4	.5-2
	11-25	24-35	1.30-1.50	0.6-2.0	0.10-0.16	3.6-6.0	Moderate-----	0.37		
	25-50	20-30	1.60-1.90	<0.06	0.01-0.05	3.6-5.0	Low-----------	0.37		
	50	---	---	---	---	---	--------------	----		
9C--------------- Viraton	0-8	15-25	1.30-1.50	0.6-2.0	0.18-0.22	4.5-7.3	Low-----------	0.43	4	.5-2
	8-31	18-35	1.30-1.50	0.6-2.0	0.08-0.16	4.5-6.0	Low-----------	0.43		
	31-59	18-30	1.60-1.90	<0.06	0.01-0.05	3.6-5.5	Low-----------	0.32		
	59-71	30-60	1.10-1.40	0.2-0.6	0.02-0.06	4.5-7.3	Moderate-----	0.28		
10E-------------- Killarney	0-3	12-20	1.10-1.40	0.6-2.0	0.10-0.14	5.1-6.0	Low-----------	0.10	4	.5-1
	3-12	12-26	1.20-1.50	0.6-2.0	0.09-0.13	4.5-6.0	Low-----------	0.10		
	12-31	25-35	1.20-1.50	0.2-0.6	0.08-0.12	3.6-5.5	Moderate-----	0.17		
	31-36	20-30	1.30-1.60	0.6-2.0	0.09-0.13	3.6-5.5	Moderate-----	0.10		
	36-57	12-30	1.60-1.90	<0.06	0.03-0.07	3.6-5.0	Low-----------	0.10		
	57-80	12-30	1.60-1.90	<0.06	0.03-0.07	3.6-5.0	Low-----------	0.17		
11C-------------- Lebanon	0-5	10-20	1.20-1.50	0.6-2.0	0.18-0.22	5.6-6.5	Low-----------	0.43	4	.5-2
	5-8	20-30	1.30-1.50	0.6-2.0	0.14-0.20	4.5-5.5	Low-----------	0.43		
	8-25	35-45	1.30-1.50	0.2-0.6	0.13-0.20	4.5-5.5	Moderate-----	0.32		
	25-37	25-40	1.60-1.90	<0.06	0.01-0.05	4.5-5.5	Low-----------	0.32		
	37-45	25-40	1.60-1.90	<0.06	0.06-0.10	4.5-5.5	Low-----------	0.32		
	45-60	40-80	1.40-1.60	0.06-0.2	0.02-0.06	4.5-5.5	Moderate-----	0.32		
12E-------------- Goss	0-2	20-27	1.10-1.30	2.0-6.0	0.06-0.10	4.5-6.5	Low-----------	0.10	2	.5-2
	2-9	20-30	1.10-1.30	2.0-6.0	0.06-0.10	4.5-6.0	Low-----------	0.10		
	9-79	35-60	1.30-1.50	0.6-2.0	0.04-0.09	4.5-6.0	Moderate-----	0.10		
13F-------------- Clarksville	0-16	14-20	1.20-1.40	2.0-6.0	0.07-0.12	3.6-6.0	Low-----------	0.28	3	.5-2
	16-58	25-35	1.30-1.45	2.0-6.0	0.06-0.10	3.6-5.5	Low-----------	0.32		
	58-68	40-75	1.20-1.40	0.6-2.0	0.05-0.08	3.6-5.5	Moderate-----	0.20		

TABLE 16.--PHYSICAL AND CHEMICAL PROPERTIES OF THE SOILS--Continued

Soil name and map symbol	Depth	Clay	Moist bulk density	Permeability	Available water capacity	Soil reaction	Shrink-swell potential	Erosion factors		Organic matter
								K	T	
	In	Pct	g/cc	In/hr	In/in	pH				Pct
18C, 18D--------- Courtois	0-10	12-27	1.20-1.40	0.6-2.0	0.18-0.23	5.1-7.3	Low----------	0.37	4	.5-2
	10-17	27-50	1.25-1.55	0.6-2.0	0.18-0.20	5.1-6.5	Moderate-----	0.28		
	17-28	40-60	1.40-1.60	0.6-2.0	0.06-0.12	5.1-7.3	Moderate-----	0.20		
	28-60	40-60	1.30-1.60	0.6-2.0	0.08-0.10	5.1-7.3	Moderate-----	0.28		
19B, 19C--------- Crider	0-7	15-27	1.20-1.40	0.6-2.0	0.19-0.23	5.1-7.3	Low----------	0.32	5	1-4
	7-33	18-35	1.20-1.45	0.6-2.0	0.18-0.23	5.1-7.3	Low----------	0.28		
	33-72	30-60	1.20-1.55	0.6-2.0	0.12-0.18	4.5-6.5	Moderate-----	0.28		
20B, 20C--------- Fourche	0-14	10-25	1.30-1.50	0.6-2.0	0.20-0.22	5.6-7.3	Low----------	0.37	5	.5-2
	14-34	27-35	1.40-1.60	0.2-0.6	0.16-0.20	4.5-6.0	Moderate-----	0.37		
	34-65	35-55	1.30-1.60	0.2-0.6	0.09-0.13	4.5-7.8	Moderate-----	0.37		
22D, 22E--------- Wilderness	0-16	18-27	1.20-1.45	2.0-6.0	0.07-0.12	4.5-6.5	Low----------	0.28	2	.5-2
	16-22	25-35	1.30-1.50	0.6-2.0	0.03-0.10	4.5-6.0	Low----------	0.28		
	22-33	20-35	1.70-2.00	0.06-0.2	0.01-0.05	3.6-5.5	Low----------	0.28		
	33-75	40-70	1.50-1.70	0.6-2.0	0.02-0.06	4.5-6.0	Moderate-----	0.28		
25A-------------- Auxvasse	0-16	8-16	1.30-1.45	0.6-2.0	0.22-0.24	4.5-7.3	Low----------	0.43	3	.5-1
	16-33	45-60	1.35-1.50	<0.06	0.09-0.11	4.5-7.8	High---------	0.43		
	33-60	25-40	1.35-1.50	0.2-0.6	0.18-0.20	4.5-7.8	Moderate-----	0.43		
31A-------------- Loughboro	0-11	12-18	1.20-1.40	0.6-2.0	0.20-0.22	4.5-7.3	Low----------	0.37	3	1-3
	11-28	36-48	1.30-1.50	0.06-0.2	0.10-0.20	4.5-5.5	High---------	0.37		
	28-60	24-35	1.50-1.60	0.2-0.6	0.10-0.15	4.5-5.5	Moderate-----	0.37		
35C-------------- Viburnum	0-7	15-25	1.30-1.50	0.6-2.0	0.19-0.21	5.1-7.3	Low----------	0.37	4	.5-2
	7-20	30-40	1.30-1.50	0.6-2.0	0.11-0.21	4.5-5.5	Moderate-----	0.32		
	20-38	35-55	1.10-1.40	0.6-2.0	0.08-0.16	3.6-5.0	High---------	0.24		
	38-60	40-70	1.10-1.40	0.2-0.6	0.03-0.12	3.6-5.0	High---------	0.24		
36B-------------- Lowell	0-10	18-27	1.20-1.40	0.6-2.0	0.18-0.23	4.5-7.3	Low----------	0.37	3	1-4
	10-14	27-33	1.20-1.40	0.2-2.0	0.16-0.20	4.5-6.5	Moderate-----	0.32		
	14-57	40-55	1.30-1.60	0.2-0.6	0.09-0.13	5.1-7.8	Moderate-----	0.28		
	57	---	---	---	---	---	-------------	----		
41D-------------- Gasconade	0-6	35-40	1.35-1.50	0.6-2.0	0.05-0.07	6.1-7.8	Moderate-----	0.20	2	2-4
	6-18	35-60	1.45-1.70	0.2-0.6	0.05-0.07	6.1-7.8	Moderate-----	0.20		
	18	---	---	---	---	---	-------------	----		
42F-------------- Irondale	0-8	7-20	1.00-1.30	0.6-2.0	0.06-0.14	4.5-6.0	Low----------	0.17	4	1-2
	8-23	15-30	1.10-1.40	0.6-2.0	0.08-0.13	3.6-5.5	Low----------	0.17		
	23-35	12-30	1.20-1.50	0.6-2.0	0.04-0.10	3.6-5.0	Low----------	0.17		
	35	---	---	---	---	---	-------------	----		
43E-------------- Syenite	0-6	12-25	1.20-1.40	0.6-2.0	0.12-0.20	5.1-6.5	Low----------	0.28	4	.5-2
	6-19	25-35	1.30-1.50	0.2-0.6	0.14-0.20	3.6-5.5	Low----------	0.28		
	19-25	15-35	1.20-1.50	0.6-2.0	0.10-0.16	3.6-5.0	Low----------	0.28		
	25-31	25-35	1.30-1.50	0.2-0.6	0.10-0.16	3.6-5.5	Low----------	0.28		
	31	---	---	---	---	---	-------------	----		
45F:										
Taumsauk---------	0-6	10-20	1.10-1.30	0.6-2.0	0.06-0.14	5.1-6.5	Low----------	0.24	2	1-2
	6-11	18-27	1.20-1.50	0.6-2.0	0.04-0.10	4.5-6.0	Low----------	0.32		
	11-16	24-30	1.30-1.50	0.6-2.0	0.04-0.10	3.6-5.5	Low----------	0.32		
	16	---	---	---	---	---	-------------	----		
Irondale---------	0-9	7-20	1.00-1.30	0.6-2.0	0.06-0.14	4.5-6.0	Low----------	0.17	4	1-2
	9-33	15-30	1.10-1.40	0.6-2.0	0.08-0.13	3.6-5.5	Low----------	0.17		
	33	---	---	---	---	---	-------------	----		
Rock outcrop.										

TABLE 16.--PHYSICAL AND CHEMICAL PROPERTIES OF THE SOILS--Continued

Soil name and map symbol	Depth	Clay	Moist bulk density	Permeability	Available water capacity	Soil reaction	Shrink-swell potential	Erosion factors		Organic matter
								K	T	
	In	Pct	g/cc	In/hr	In/in	pH				Pct
52B--------------	0-7	15-25	1.10-1.30	0.6-2.0	0.16-0.20	5.1-6.5	Low----------	0.32	4	<2
Secesh	7-30	20-30	1.20-1.40	0.6-2.0	0.13-0.19	4.5-6.0	Low----------	0.32		
	30-60	25-35	1.30-1.50	2.0-6.0	0.03-0.08	4.5-7.3	Low----------	0.24		
67---------------	0-5	10-17	1.30-1.50	0.6-2.0	0.22-0.24	5.6-7.3	Low----------	0.37	5	.5-3
Wakeland	5-60	10-17	1.30-1.50	0.6-2.0	0.20-0.22	5.6-7.3	Low----------	0.37		
80B--------------	0-8	10-20	1.10-1.30	2.0-6.0	0.07-0.13	5.6-7.3	Low----------	0.24	5	.5-2
Bloomsdale	8-24	10-25	1.10-1.30	2.0-6.0	0.07-0.13	5.6-7.3	Low----------	0.24		
	24-60	35-50	1.20-1.50	0.6-2.0	0.05-0.09	5.6-7.3	Moderate-----	0.24		
81A--------------	0-7	15-25	1.10-1.30	2.0-6.0	0.09-0.13	5.6-6.5	Low----------	0.28	5	.5-2
Midco	7-40	10-25	1.20-1.40	2.0-6.0	0.05-0.11	5.1-7.3	Low----------	0.24		
	40-60	5-25	1.10-1.30	2.0-6.0	0.02-0.06	5.1-7.3	Low----------	0.24		
82A--------------	0-23	20-27	1.25-1.40	0.6-2.0	0.22-0.24	6.1-7.3	Low----------	0.32	5	2-4
Dameron	23-29	27-35	1.30-1.40	0.6-2.0	0.18-0.20	6.1-7.3	Moderate-----	0.32		
	29-36	27-35	1.30-1.50	0.6-2.0	0.05-0.10	5.6-7.3	Low----------	0.32		
	36-44	35-55	1.30-1.50	0.2-0.6	0.05-0.10	5.6-7.3	Moderate-----	0.20		
	44-60	35-55	1.30-1.50	0.2-0.6	0.04-0.09	5.6-7.3	Moderate-----	0.20		
91. Udipsamments										
94. Pits and dumps										

TABLE 17.--SOIL AND WATER FEATURES

("Flooding" and "water table" and terms such as "rare," "brief," "apparent," and "perched" are explained in the text. The symbol < means less than; > means more than. Absence of an entry indicates that the feature is not a concern or that data were not estimated)

Soil name and map symbol	Hydrologic group	Flooding			High water table			Bedrock		Potential frost action	Risk of corrosion	
		Frequency	Duration	Months	Depth	Kind	Months	Depth	Hardness		Uncoated steel	Concrete
					Ft			In				
1C: Lamotte	B	None	---	---	>6.0	---	---	>60	---	Moderate	Moderate	High.
2B, 2C, 2D, 2E: Gatewood	C	None	---	---	>6.0	---	---	20-40	Hard	Moderate	High	Moderate.
4C, 4D: Knobtop	C	None	---	---	2.0-3.0	Perched	Dec-Apr	20-40	Hard	High	Moderate	High.
6C, 6D: Delassus	C	None	---	---	2.0-3.0	Perched	Dec-Apr	>48	Hard	Moderate	High	High.
9C: Viraton	C	None	---	---	1.5-2.5	Perched	Dec-Apr	>60	---	Moderate	Moderate	High.
10E: Killarney	C	None	---	---	2.0-3.0	Perched	Dec-Apr	>60	---	Moderate	High	High.
11C: Lebanon	C	None	---	---	1.0-2.0	Perched	Dec-Apr	>60	---	Moderate	Moderate	High.
12E: Goss	B	None	---	---	>6.0	---	---	>60	---	Moderate	Moderate	Moderate.
13F: Clarksville	B	None	---	---	>6.0	---	---	>60	---	Moderate	Low	High.
18C, 18D: Courtois	B	None	---	---	>6.0	---	---	>60	---	Moderate	High	Moderate.
19B, 19C: Crider	B	None	---	---	>6.0	---	---	>60	---	High	Moderate	Moderate.
20B, 20C: Fourche	B	None	---	---	1.5-3.0	Perched	Dec-Apr	>60	---	Moderate	Moderate	Moderate.
22D, 22E: Wilderness	C	None	---	---	1.0-2.0	Perched	Dec-Apr	>60	---	Moderate	Moderate	High.
25A: Auxvasse	D	None	---	---	1.0-2.0	Perched	Dec-Apr	>60	---	Moderate	High	High.
31A: Loughboro	C	None	---	---	1.0-2.0	Perched	Dec-Apr	>60	---	High	High	High.

TABLE 17.--SOIL AND WATER FEATURES--Continued

Soil name and map symbol	Hydro-logic group	Flooding			High water table			Bedrock		Potential frost action	Risk of corrosion	
		Frequency	Duration	Months	Depth	Kind	Months	Depth	Hardness		Uncoated steel	Concrete
					Ft			In				
35C---------------- Viburnum	C	None---------	---	---	1.5-2.5	Perched	Dec-Apr	>60	---	Moderate	High-----	Moderate.
36B---------------- Lowell	C	None---------	---	---	2.5-5.0	Perched	Dec-Apr	>40	Hard	Moderate	High-----	Moderate.
41D---------------- Gasconade	D	None---------	---	---	>6.0	---	---	4-20	Hard	Moderate	High-----	Low.
42F---------------- Irondale	C	None---------	---	---	>6.0	---	---	20-40	Hard	Moderate	High-----	High.
43E---------------- Syenite	C	None---------	---	---	>6.0	---	---	20-40	Hard	Moderate	Moderate	High.
45F:												
Taumsauk----------	D	None---------	---	---	>6.0	---	---	4-20	Hard	Moderate	High-----	High.
Irondale----------	C	None---------	---	---	>6.0	---	---	20-40	Hard	Moderate	High-----	High.
Rock outcrop.												
52B---------------- Secesh	B	Rare---------	---	---	>6.0	---	---	>60	---	Moderate	Low------	Moderate.
67----------------- Wakeland	C	Frequent----	Brief to long.	Dec-Apr	1.0-3.0	Apparent	Dec-Apr	>60	---	High-----	High-----	Low.
80B---------------- Bloomsdale	B	Frequent----	Very brief	Dec-Apr	>6.0	---	---	>60	---	Moderate	Low------	Moderate.
81A---------------- Midco	A	Frequent----	Very brief	Dec-Apr	>6.0	---	---	>60	---	Moderate	Low------	Moderate.
82A---------------- Dameron	B	Frequent----	Very brief	Dec-Apr	>6.0	---	---	>60	---	Low------	Low------	Low.
91. Udipsamments												
94. Pits and dumps												

TABLE 18.--CLASSIFICATION OF THE SOILS

(An asterisk in the first column indicates that the soil is a taxadjunct to the series. See text for a description of those characteristics of the soil that are outside the range of the series)

Soil name	Family or higher taxonomic class
Auxvasse	Fine, montmorillonitic, mesic Aeric Albaqualfs
Bloomsdale	Loamy-skeletal, mixed, nonacid, mesic Typic Udifluvents
Clarksville	Loamy-skeletal, siliceous, mesic Typic Paleudults
Courtois	Fine, mixed, mesic Typic Paleudalfs
Crider	Fine-silty, mixed, mesic Typic Paleudalfs
Dameron	Fine-loamy, mixed, mesic Cumulic Hapludolls
Delassus	Fine-loamy, mixed, mesic Typic Fragiudults
Fourche	Fine-silty, mixed, mesic Glossic Paleudalfs
Gasconade	Clayey-skeletal, mixed, mesic Lithic Hapludolls
Gatewood	Very fine, mixed, mesic Typic Hapludalfs
Goss	Clayey-skeletal, mixed, mesic Typic Paleudalfs
Irondale	Loamy-skeletal, mixed, mesic Typic Hapludults
Killarney	Loamy-skeletal, mixed, mesic Typic Fragiudults
Knobtop	Fine-silty, mixed, mesic Aquic Hapludults
Lamotte	Fine-loamy, mixed, mesic Ultic Hapludalfs
Lebanon	Fine, mixed, mesic Typic Fragiudalfs
Loughboro	Fine, montmorillonitic, mesic Aeric Glossaqualfs
Lowell	Fine, mixed, mesic Typic Hapludalfs
Midco	Loamy-skeletal, siliceous, nonacid, mesic Typic Udifluvents
*Secesh	Fine-loamy, siliceous, mesic Ultic Hapludalfs
Syenite	Fine-loamy, mixed, mesic Typic Hapludults
Taumsauk	Loamy-skeletal, mixed, mesic Lithic Hapludults
Udipsamments	Mixed, mesic Udipsamments
Viburnum	Clayey, mixed, mesic Aquic Paleudults
Viraton	Fine-loamy, siliceous, mesic Typic Fragiudalfs
Wakeland	Coarse-silty, mixed, nonacid, mesic Aeric Fluvaquents
Wilderness	Loamy-skeletal, siliceous, mesic Typic Fragiudalfs

* U.S. GOVERNMENT PRINTING OFFICE: 1991-281-364/20055

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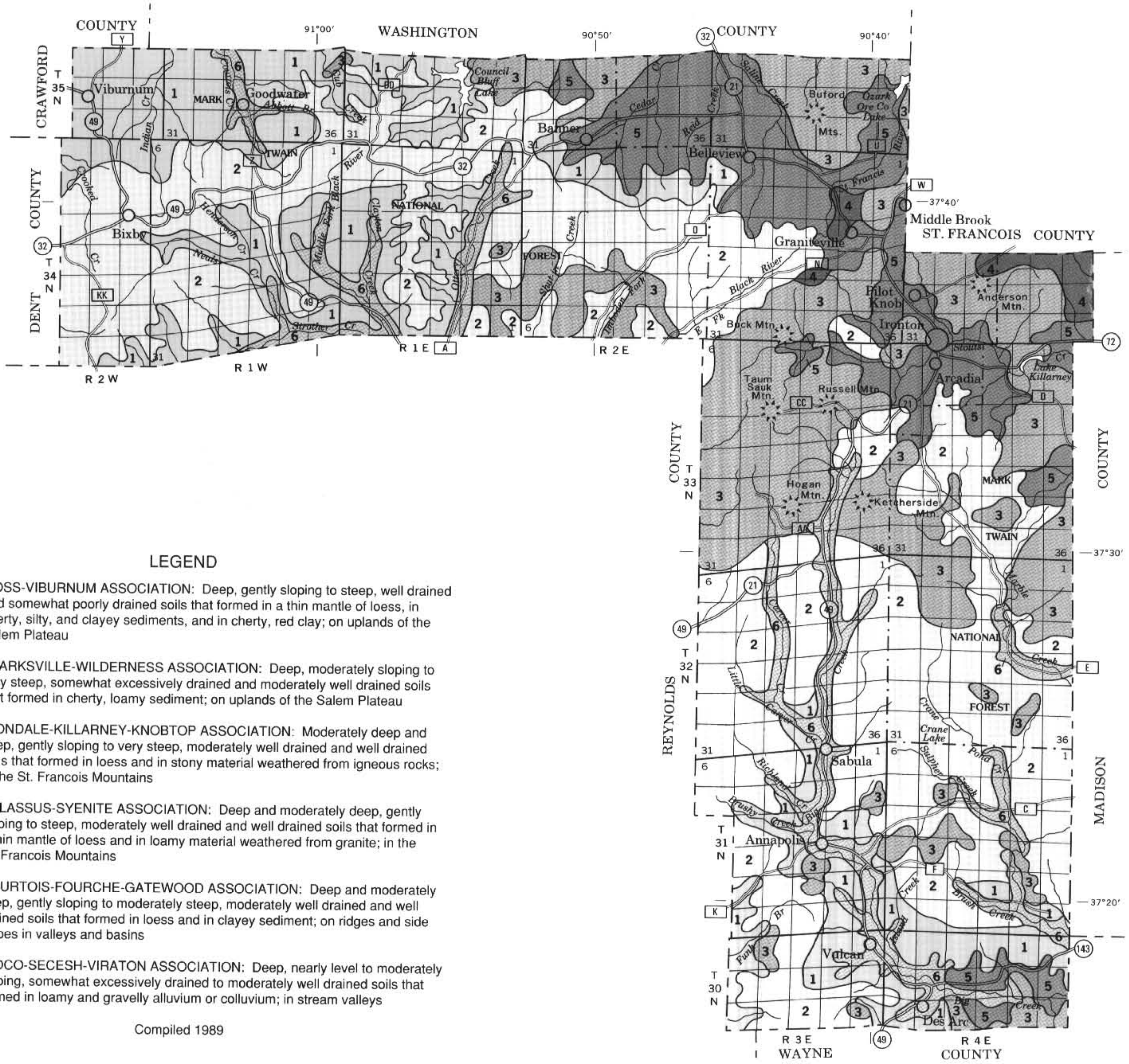
Each area outlined on this map consists of more than one kind of soil. The map is thus meant for general planning rather than a basis for decisions on the use of specific tracts.



LEGEND

1	GOSS-VIBURNUM ASSOCIATION: Deep, gently sloping to steep, well drained and somewhat poorly drained soils that formed in a thin mantle of loess, in cherty, silty, and clayey sediments, and in cherty, red clay; on uplands of the Salem Plateau
2	CLARKSVILLE-WILDERNESS ASSOCIATION: Deep, moderately sloping to very steep, somewhat excessively drained and moderately well drained soils that formed in cherty, loamy sediment; on uplands of the Salem Plateau
3	IRONDALE-KILLARNEY-KNOBTOP ASSOCIATION: Moderately deep and deep, gently sloping to very steep, moderately well drained and well drained soils that formed in loess and in stony material weathered from igneous rocks; in the St. Francois Mountains
4	DELASSUS-SYENITE ASSOCIATION: Deep and moderately deep, gently sloping to steep, moderately well drained and well drained soils that formed in a thin mantle of loess and in loamy material weathered from granite; in the St. Francois Mountains
5	COURTOIS-FOURCHE-GATEWOOD ASSOCIATION: Deep and moderately deep, gently sloping to moderately steep, moderately well drained and well drained soils that formed in loess and in clayey sediment; on ridges and side slopes in valleys and basins
6	MIDCO-SECESH-VIRATON ASSOCIATION: Deep, nearly level to moderately sloping, somewhat excessively drained to moderately well drained soils that formed in loamy and gravelly alluvium or colluvium; in stream valleys

Compiled 1989

SECTIONALIZED TOWNSHIP

6	5	4	3	2	1
7	8	9	10	11	12
18	17	16	15	14	13
19	20	21	22	23	24
30	29	28	27	26	25
31	32	33	34	35	36

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UNITED STATES DEPARTMENT OF AGRICULTURE
SOIL CONSERVATION SERVICE AND FOREST SERVICE
MISSOURI AGRICULTURAL EXPERIMENT STATION

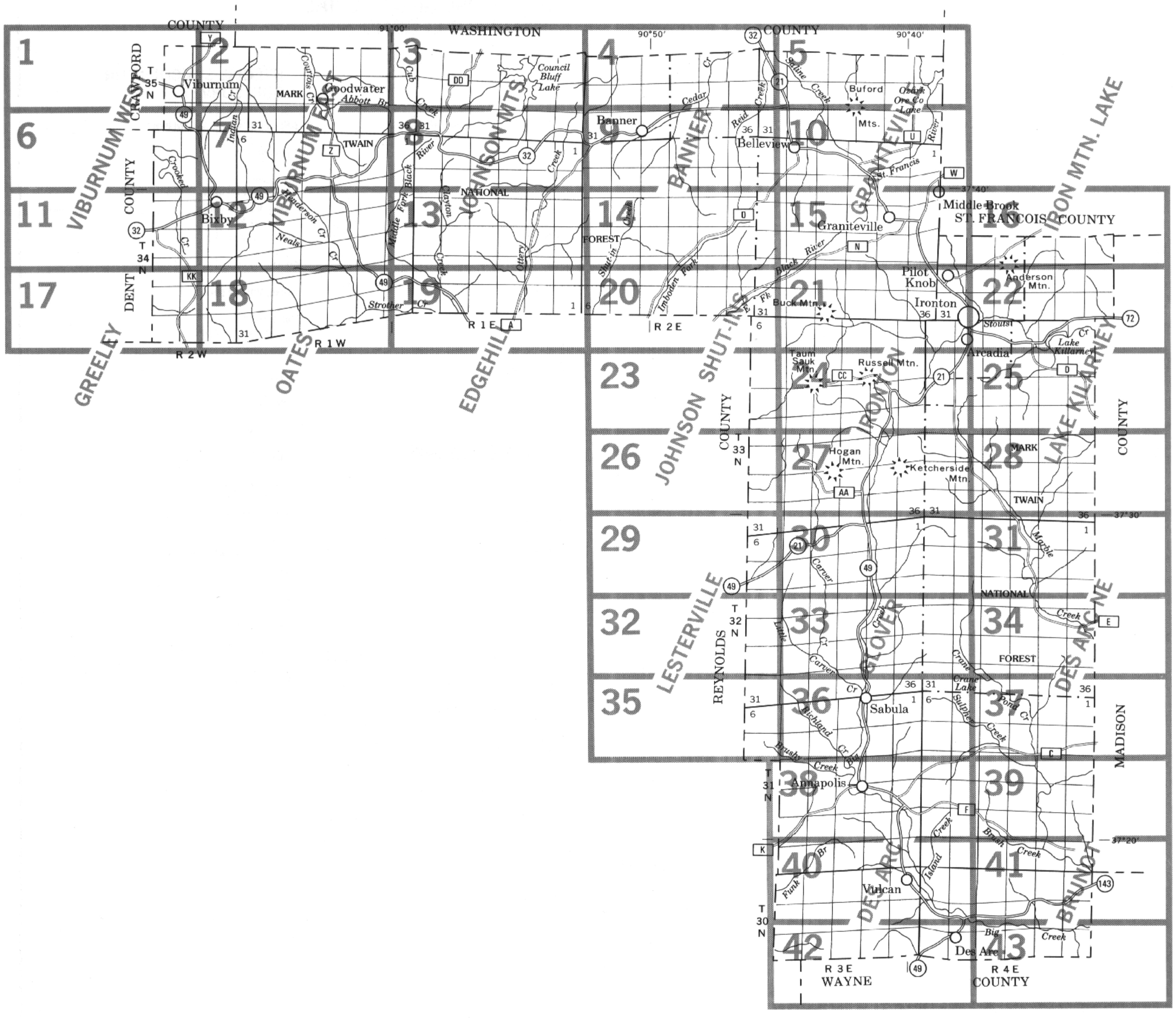
GENERAL SOIL MAP

IRON COUNTY, MISSOURI

Scale 1:253,440

1 0 1 2 3 4 Mi

1 0 4 8 Km



General Soil Map

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Legend

SECTIONALIZED TOWNSHIP

6	5	4	3	2	1
7	8	9	10	11	12
18	17	16	15	14	13
19	20	21	22	23	24
30	29	28	27	26	25
31	32	33	34	35	36

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IRON COUNTY, MISSOURI

SOIL LEGEND

Map symbols consist of numbers or a combination of numbers and a letter. The initial numbers represent the kind of soil. A capital letter following these numbers indicates the class of slope. Symbols without a slope letter are for nearly level soils, units of higher taxonomic classification, or miscellaneous areas.

SYMBOL	NAME
1C	Lamotte silt loam, 3 to 9 percent slopes
2B	Gatewood silt loam, 2 to 5 percent slopes
2C	Gatewood silt loam, 5 to 9 percent slopes
2D	Gatewood silt loam, 9 to 14 percent slopes
2E	Gatewood silt loam, 14 to 20 percent slopes, stony
4C	Knobtop silt loam, 3 to 9 percent slopes
4D	Knobtop silt loam, 3 to 12 percent slopes, very stony
6C	Delassus silt loam, 3 to 9 percent slopes
6D	Delassus silt loam, 5 to 14 percent slopes, bouldery
9C	Viraton silt loam, 3 to 9 percent slopes
10E	Killarney very cobbly silt loam, 14 to 50 percent slopes, rubbly
11C	Lebanon silt loam, 3 to 9 percent slopes
12E	Goss very cherty silt loam, 14 to 35 percent slopes
13F	Clarksville very cherty silt loam, 25 to 50 percent slopes
18C	Courtois silt loam, 3 to 9 percent slopes
18D	Courtois silt loam, 9 to 14 percent slopes
19B	Crider silt loam, 2 to 5 percent slopes
19C	Crider silt loam, 5 to 9 percent slopes
20B	Fourche silt loam, 2 to 5 percent slopes
20C	Fourche silt loam, 5 to 9 percent slopes
22D	Wilderness very cherty silt loam, 5 to 14 percent slopes
22E	Wilderness very cherty silt loam, 14 to 30 percent slopes
25A	Auxvasse silt loam, 0 to 3 percent slopes
31A	Loughboro silt loam, 0 to 3 percent slopes
35C	Viburnum silt loam, 3 to 9 percent slopes
36B	Lowell silt loam, 2 to 5 percent slopes
41D	Gasconade flaggy silty clay loam, 5 to 20 percent slopes, extremely stony
42F	Irondale very cobbly silt loam, 15 to 40 percent slopes, rubbly
43E	Syenite silt loam, 10 to 25 percent slopes, extremely bouldery
45F	Taumsauk-Irondale-Rock outcrop complex, 15 to 40 percent slopes, rubbly
52B	Secesh silt loam, 1 to 4 percent slopes
67	Wakeland silt loam
80B	Bloomsdale very gravelly loam, 0 to 4 percent slopes
81A	Midco cherty loam, 0 to 3 percent slopes
82A	Dameron silt loam, clayey substratum, 0 to 3 percent slopes
91	Udipsamments, sloping
94	Pits and dumps

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General Soil Map

CONVENTIONAL AND SPECIAL SYMBOLS LEGEND

CULTURAL FEATURES

BOUNDARIES

National, state or province

County or parish

Minor civil division

Reservation (national forest or park, state forest or park, and large airport)

Land grant

Limit of soil survey (label)

Field sheet matchline and neatline

AD HOC BOUNDARY (label) — Swift Airport

Small airport, airfield, park, oilfield, cemetery, or flood pool — FLOOD POOL LINE

STATE COORDINATE TICK

LAND DIVISION CORNER (sections and land grants)

ROADS

Divided (median shown if scale permits)

Other roads

Trail

ROAD EMBLEM & DESIGNATIONS

Interstate — 21

Federal — 173

State — 28

County, farm or ranch — 1283

RAILROAD

POWER TRANSMISSION LINE (normally not shown)

PIPE LINE (normally not shown)

FENCE (normally not shown)

LEVEES

Without road

With road

With railroad

DAMS

Large (to scale)

Medium or Small — water, w

PITS

Gravel pit

Mine or quarry

MISCELLANEOUS CULTURAL FEATURES

Farmstead, house (omit in urban areas)

Church

School

Indian mound (label) — Indian Mound

Located object (label) — Tower

Tank (label) — Gas

Wells, oil or gas

Windmill

Kitchen midden

WATER FEATURES

DRAINAGE

Perennial, double line

Perennial, single line

Intermittent

Drainage end

Canals or ditches

Double-line (label) — CANAL

Drainage and/or irrigation

LAKES, PONDS AND RESERVOIRS

Perennial — water, w

Intermittent — int, i

MISCELLANEOUS WATER FEATURES

Marsh or swamp

Spring

Well, artesian

Well, irrigation

Wet spot

SPECIAL SYMBOLS FOR SOIL SURVEY

SOIL DELINEATIONS AND SYMBOLS — 43E, 80B

ESCARPMENTS

Bedrock (points down slope)

Other than bedrock (points down slope)

SHORT STEEP SLOPE

GULLY

DEPRESSION OR SINK

SOIL SAMPLE (normally not shown)

MISCELLANEOUS

Blowout

Clay spot

Gravelly spot

Gumbo, slick or scabby spot (sodic)

Dumps and other similar non soil areas

Prominent hill or peak

Rock outcrop (includes sandstone and shale)

Saline spot

Sandy spot

Severely eroded spot

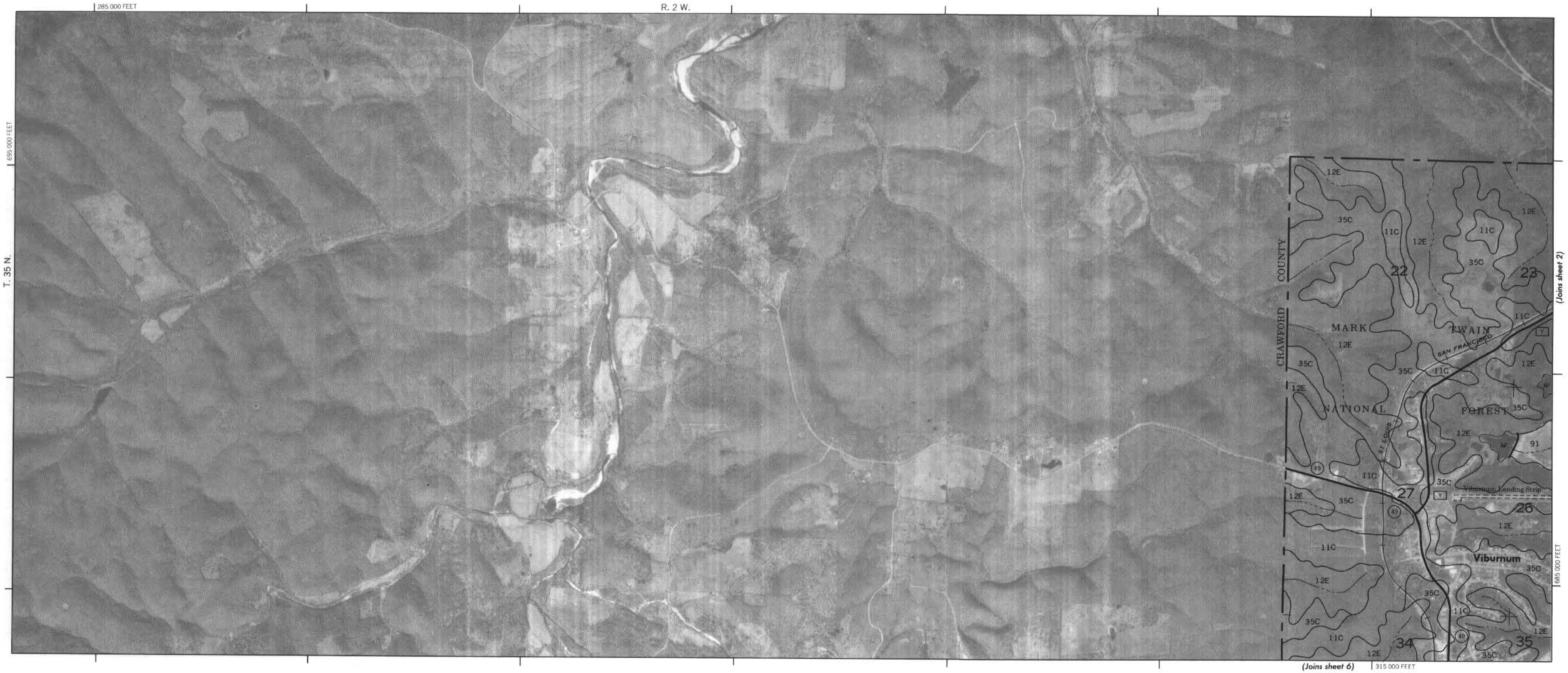
Slide or slip (tips point upslope)

Stony spot, very stony spot

SOIL SURVEY OF IRON COUNTY, MISSOURI — SHEET NUMBER 1

1

N



1 3/4 1/2 1/4 0 1 2 MILES

1 0.5 0 1 2 KILOMETERS

SCALE 1:24 000

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SOIL SURVEY OF IRON COUNTY, MISSOURI — SHEET NUMBER 2

SOIL SURVEY OF IRON COUNTY, MISSOURI — SHEET NUMBER 3

1 3/4 1/2 1/4 0 1 2 MILES

1 0.5 0 1 2 KILOMETERS

SCALE 1:24 000

SOIL SURVEY OF IRON COUNTY, MISSOURI — SHEET NUMBER 4

4
N

1 3/4 1/2 1/4 0 1 2 MILES
1 0.5 0 1 2 KILOMETERS
SCALE 1:24 000

SOIL SURVEY OF IRON COUNTY, MISSOURI — SHEET NUMBER 5

5

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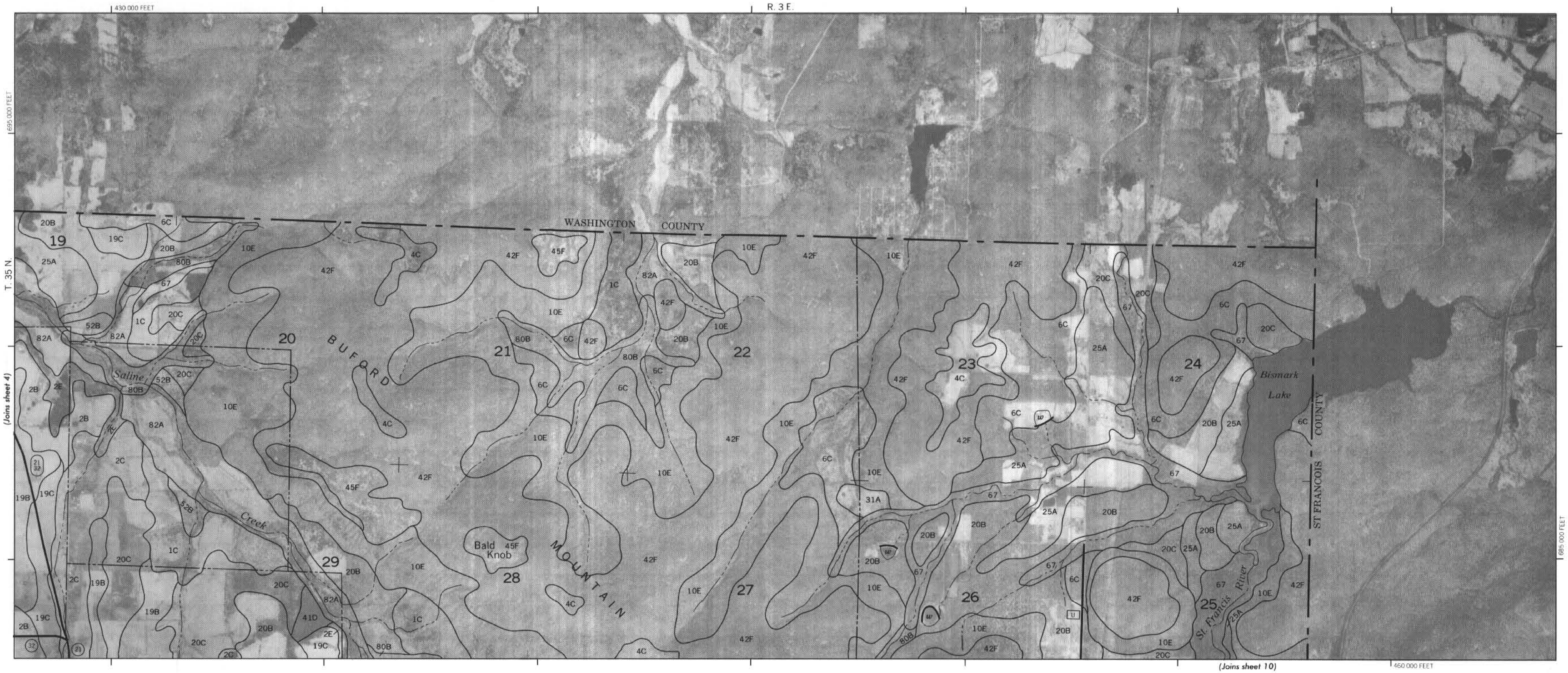

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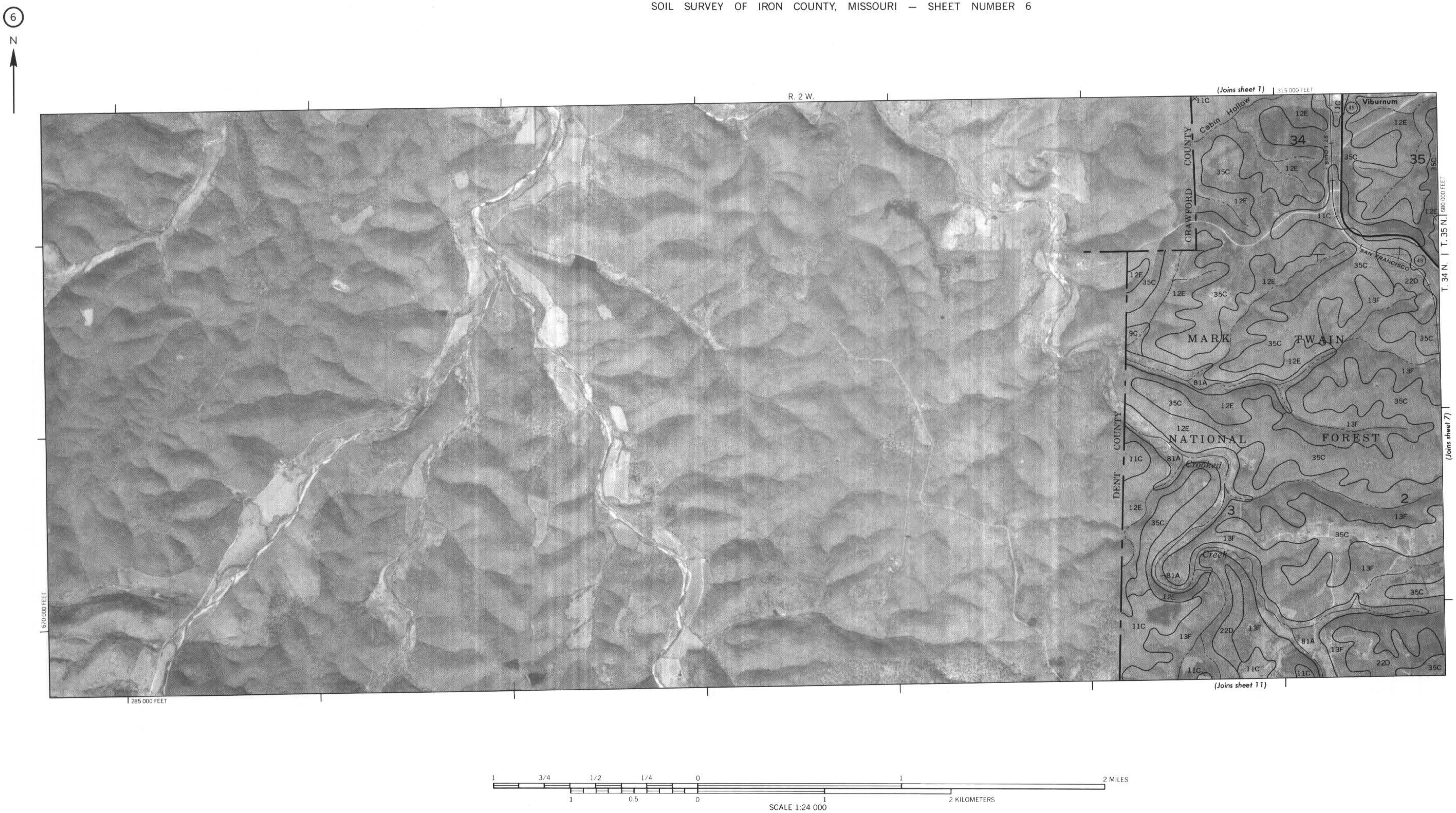

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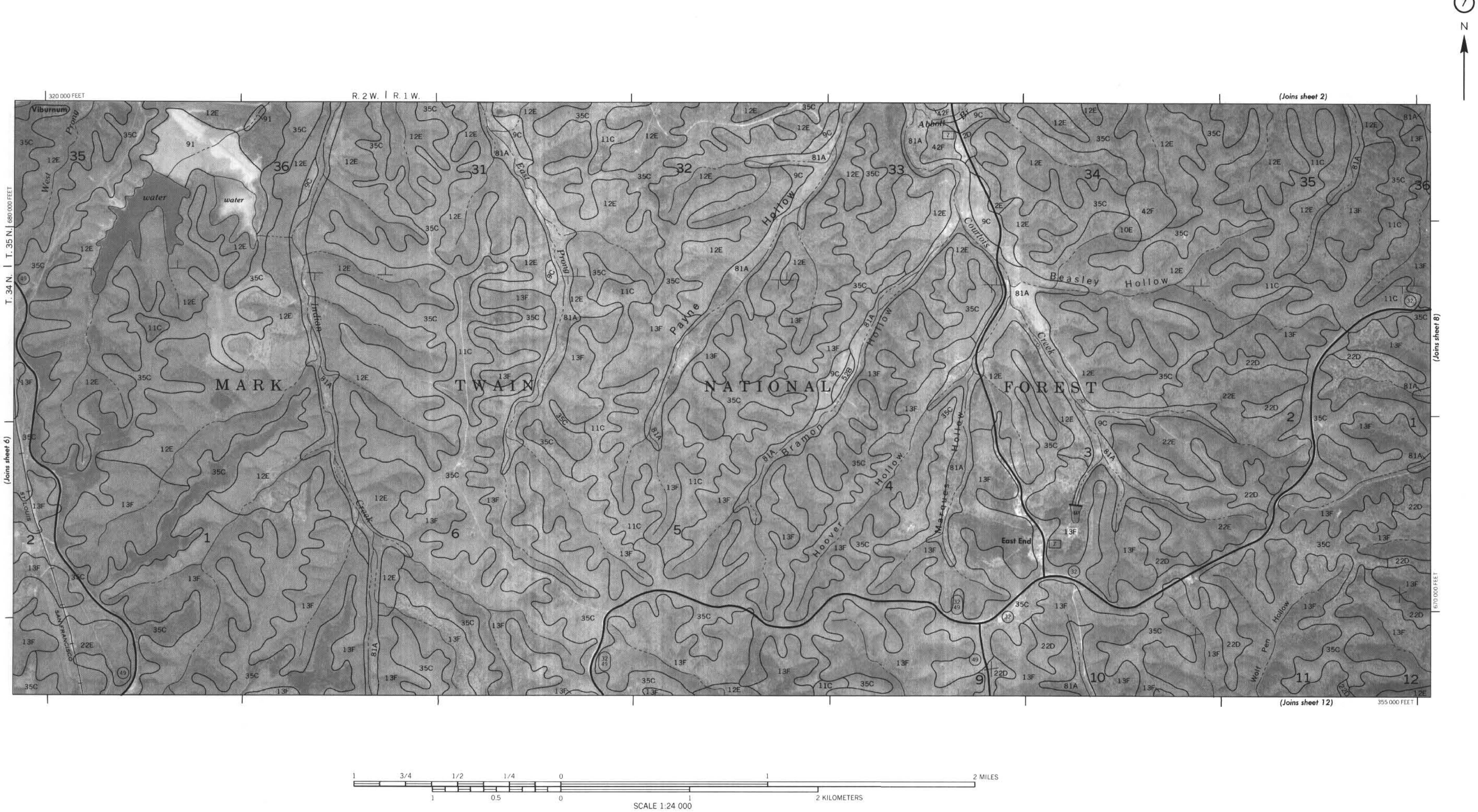
SOIL SURVEY OF IRON COUNTY, MISSOURI — SHEET NUMBER 7



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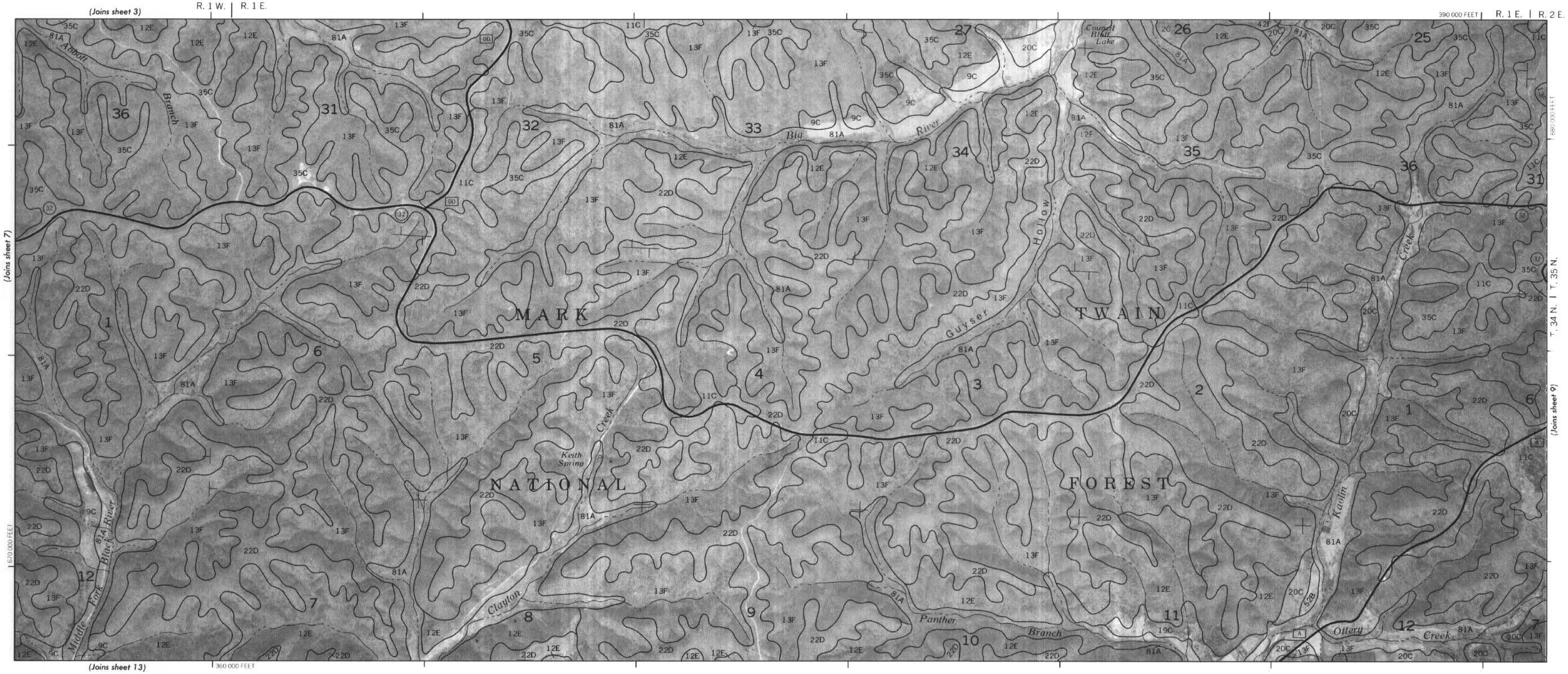
SOIL SURVEY OF IRON COUNTY, MISSOURI — SHEET NUMBER 8

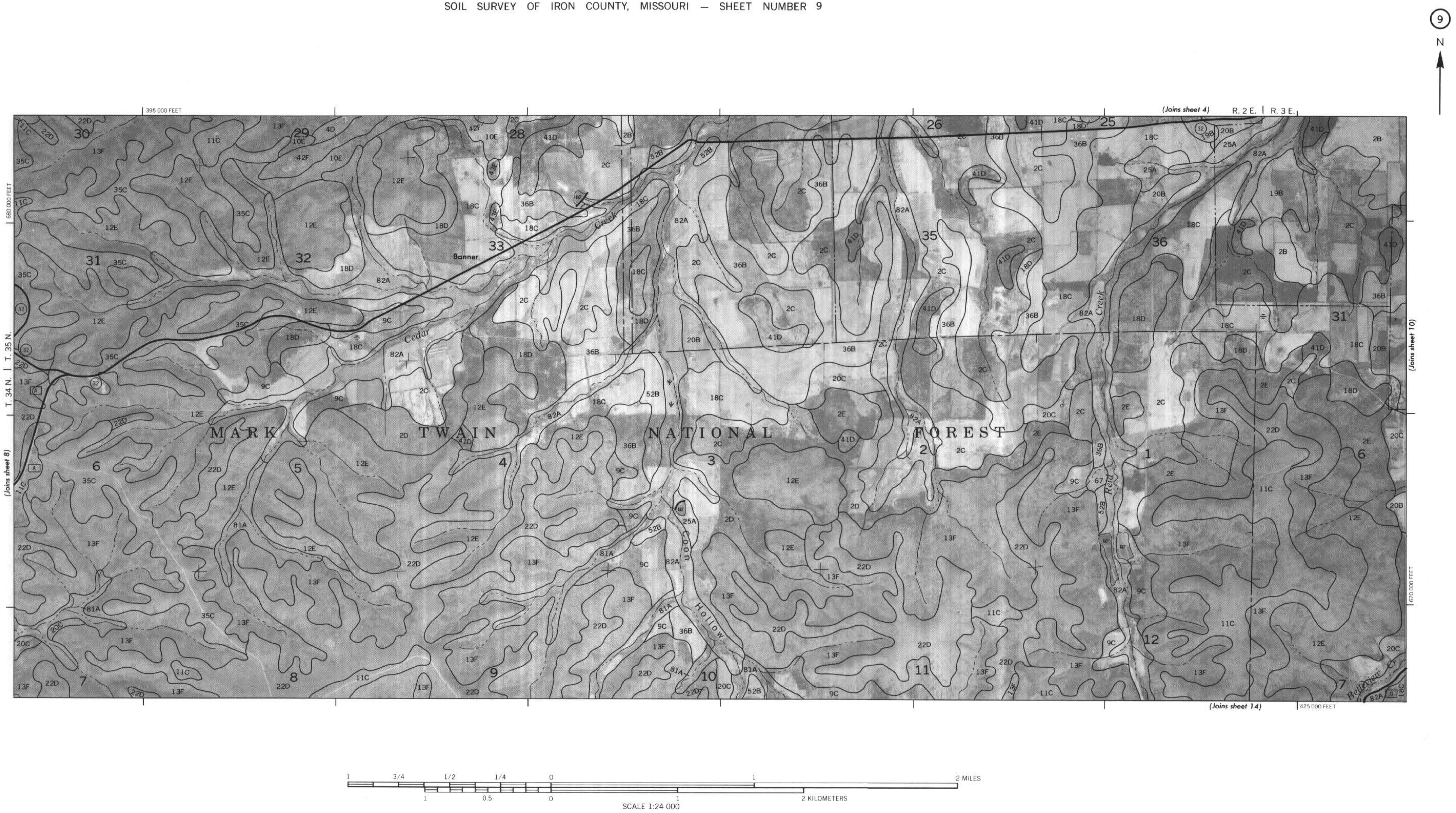


1 3/4 1/2 1/4 0 1 2 MILES

1 0.5 0 1 2 KILOMETERS

SCALE 1:24 000

SOIL SURVEY OF IRON COUNTY, MISSOURI — SHEET NUMBER 9



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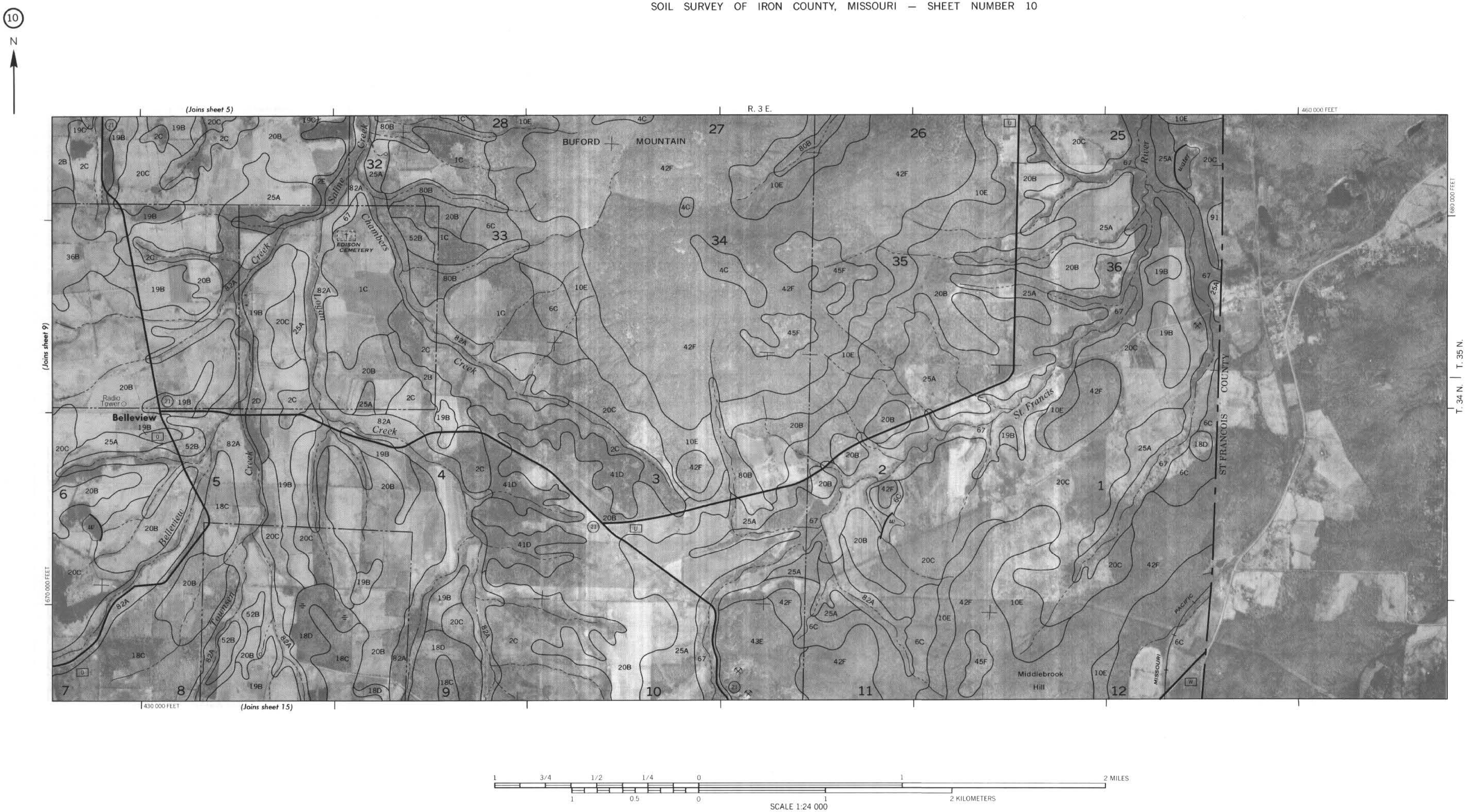

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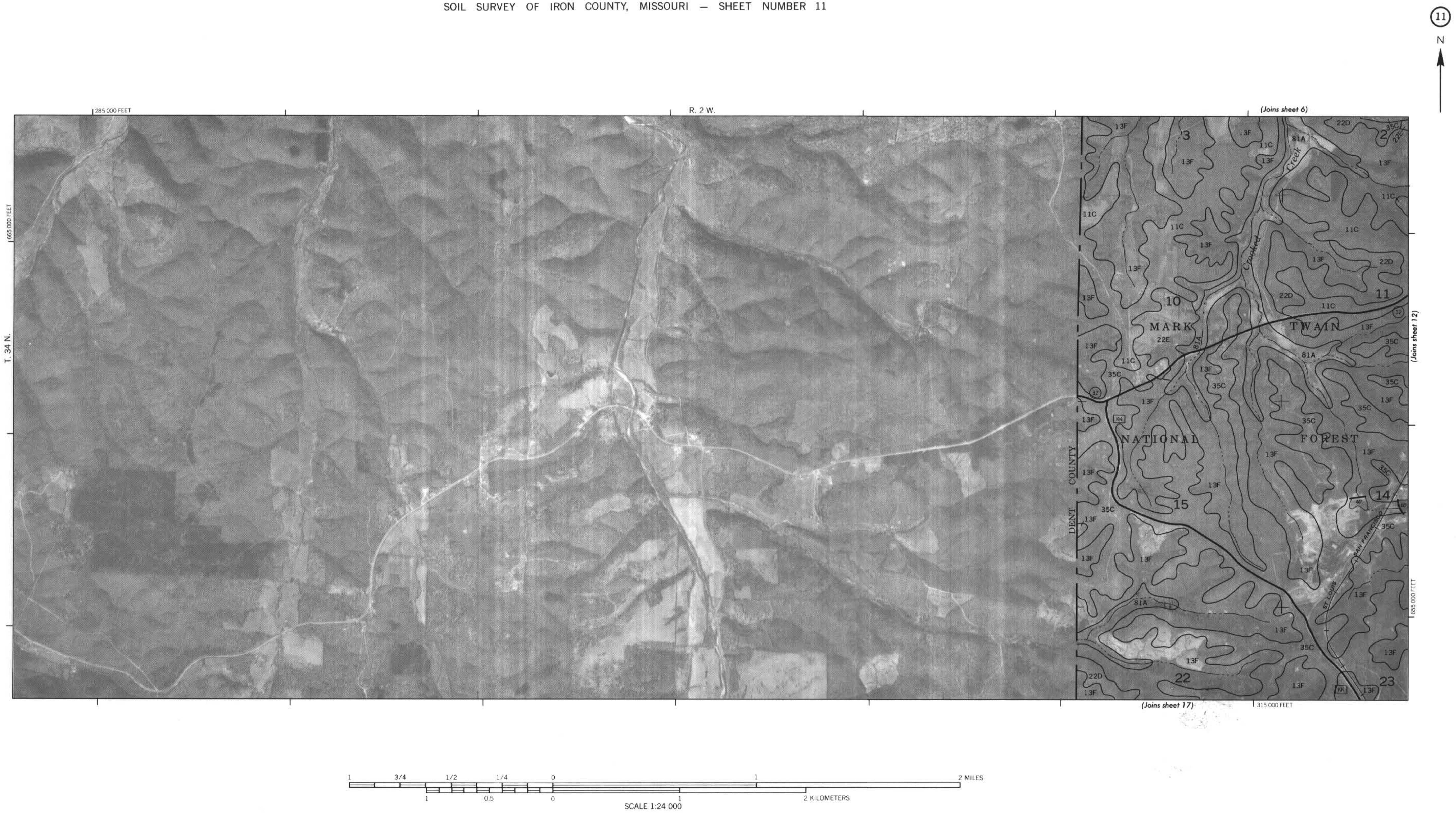
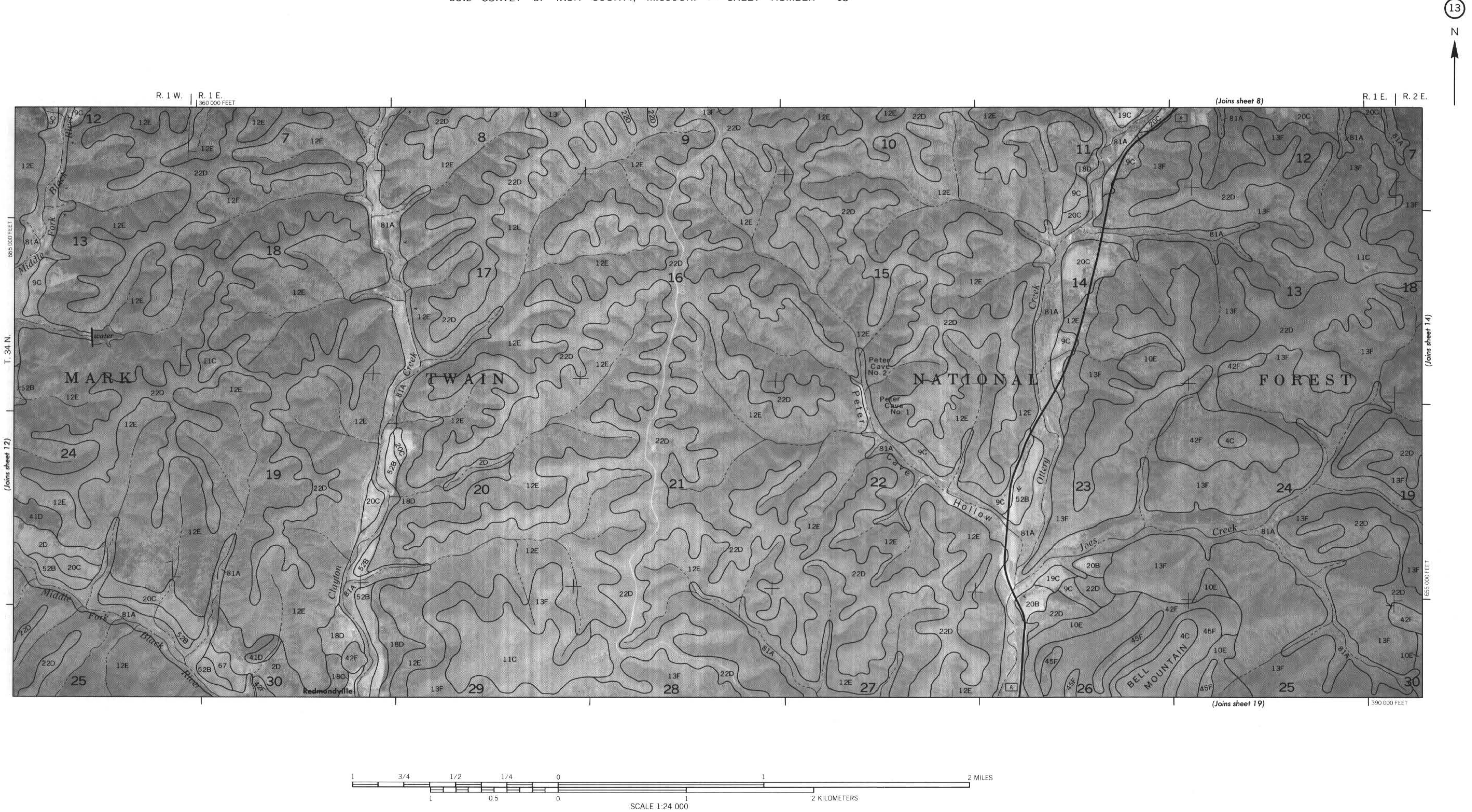


SOIL SURVEY OF IRON COUNTY, MISSOURI — SHEET NUMBER 12

SOIL SURVEY OF IRON COUNTY, MISSOURI — SHEET NUMBER 13



SOIL SURVEY OF IRON COUNTY, MISSOURI — SHEET NUMBER 14

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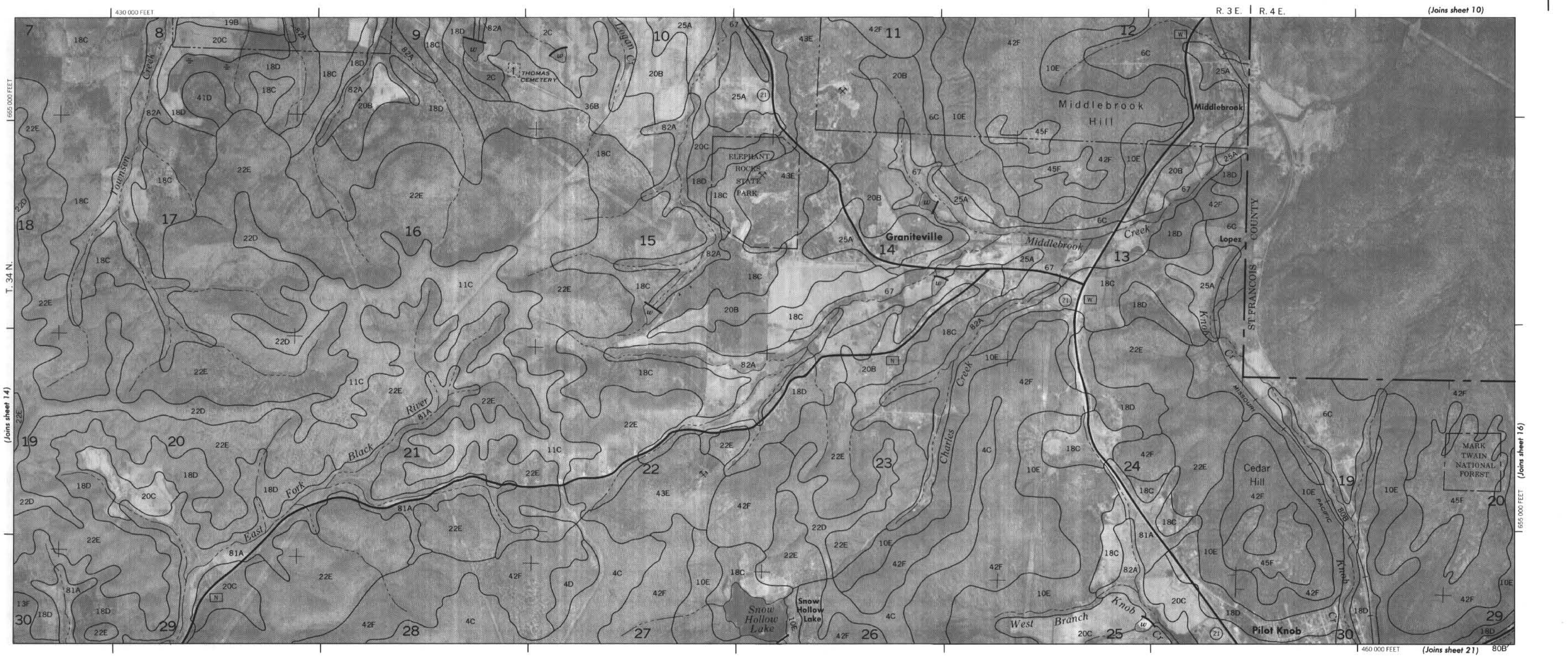

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1 0.5 0 1 2 KILOMETERS

16

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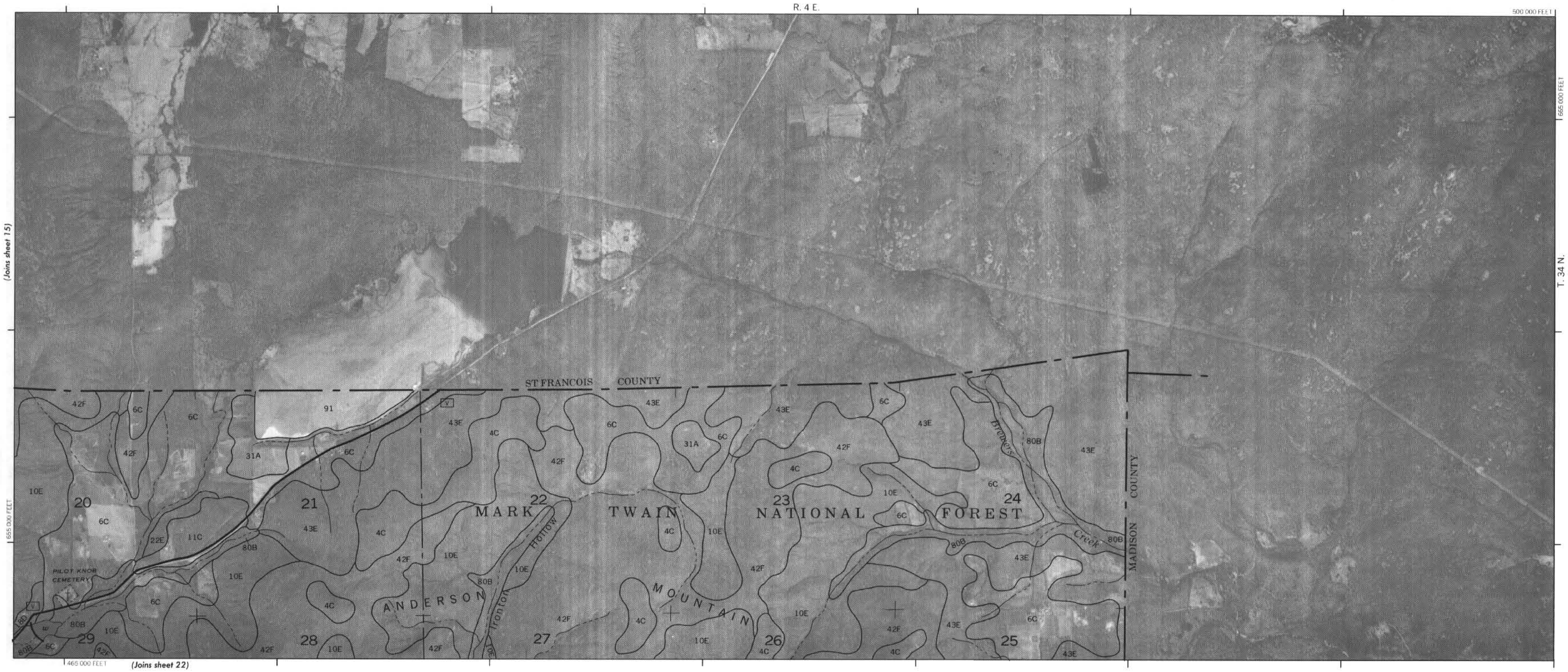
SOIL SURVEY OF IRON COUNTY, MISSOURI — SHEET NUMBER 16



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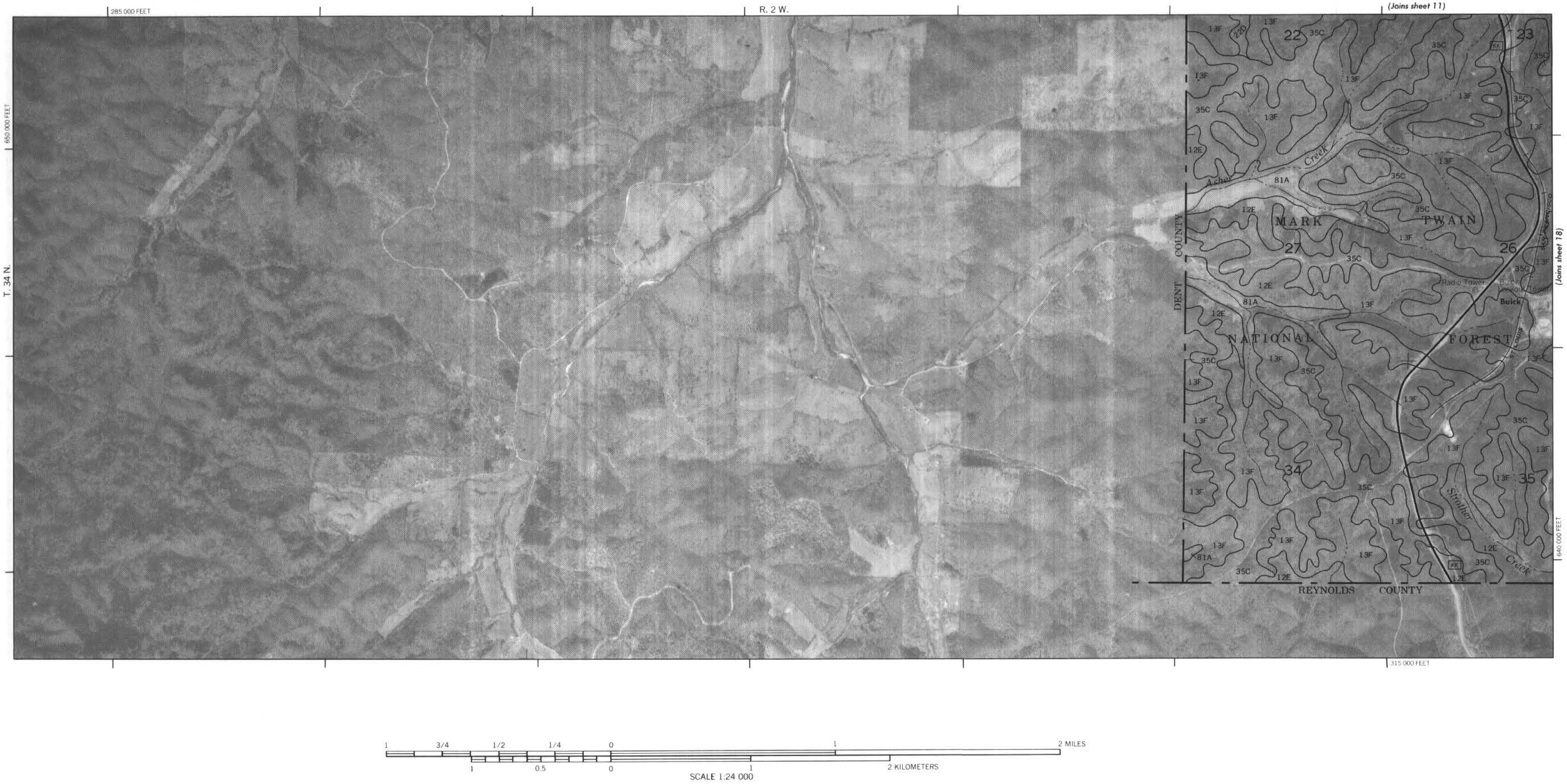

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SOIL SURVEY OF IRON COUNTY, MISSOURI — SHEET NUMBER 18

SCALE 1:24 000

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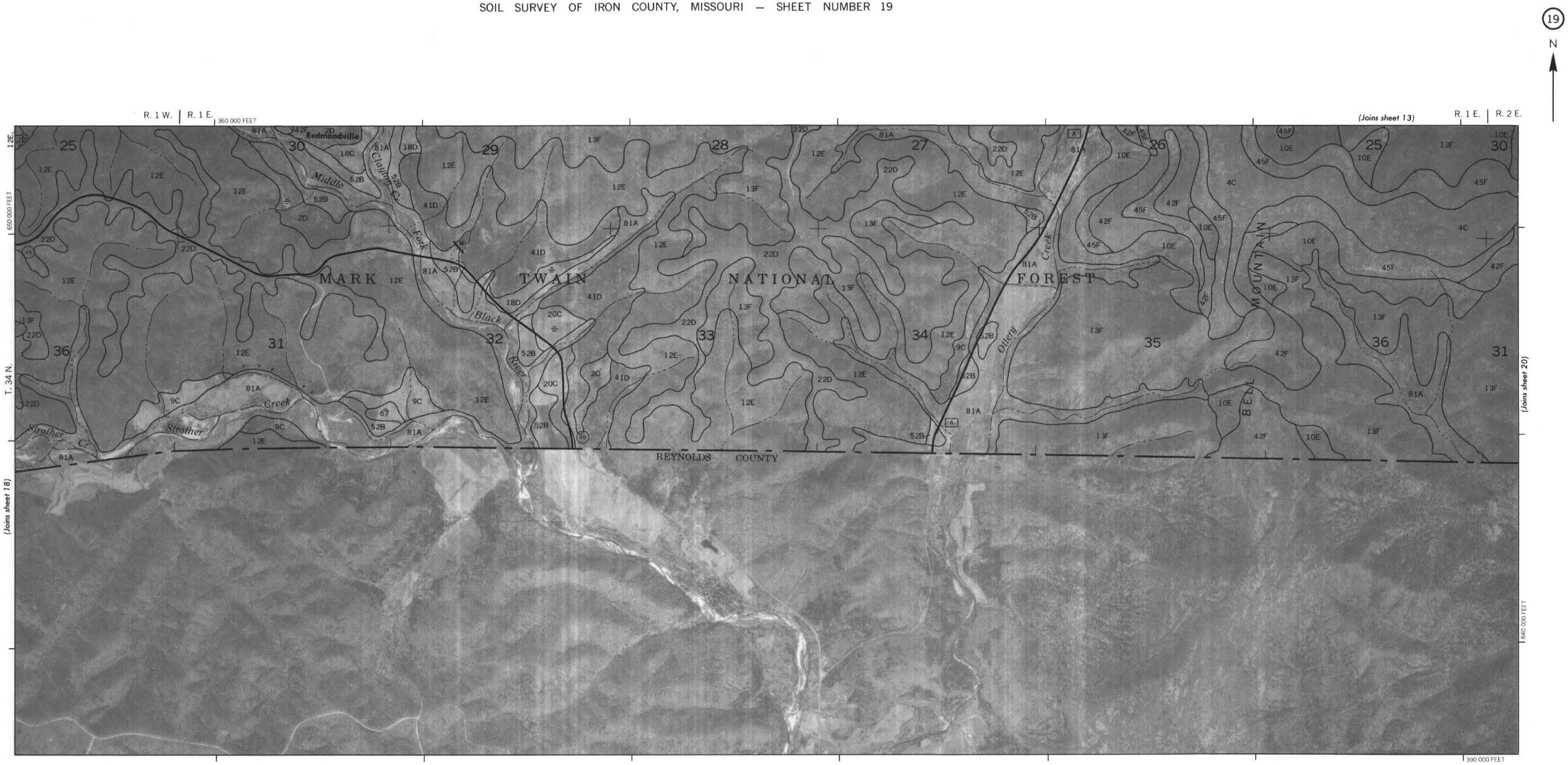
SOIL SURVEY OF IRON COUNTY, MISSOURI — SHEET NUMBER 19



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SCALE 1:24 000

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SOIL SURVEY OF IRON COUNTY, MISSOURI — SHEET NUMBER 20

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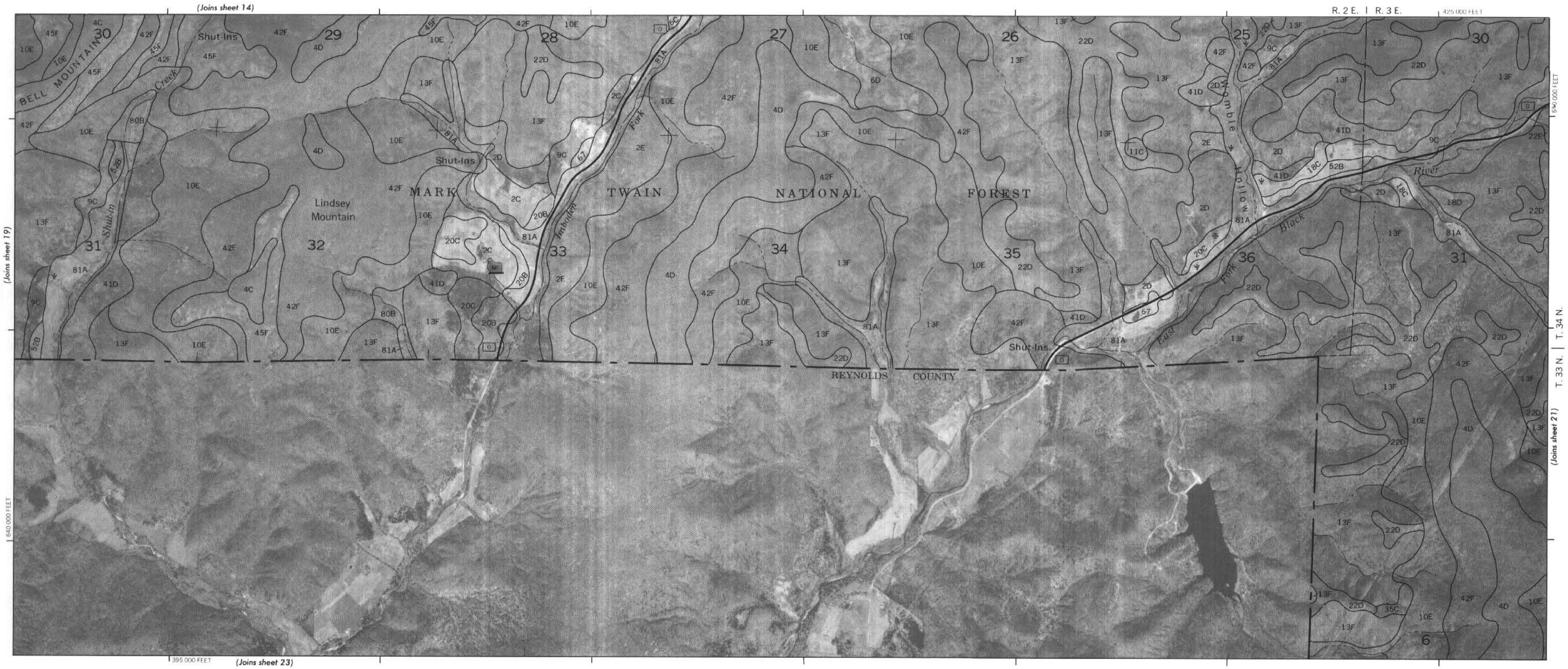

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1 0.5 0 1 2 KILOMETERS

SCALE 1:24 000

SOIL SURVEY OF IRON COUNTY, MISSOURI — SHEET NUMBER 21

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SCALE 1:24 000

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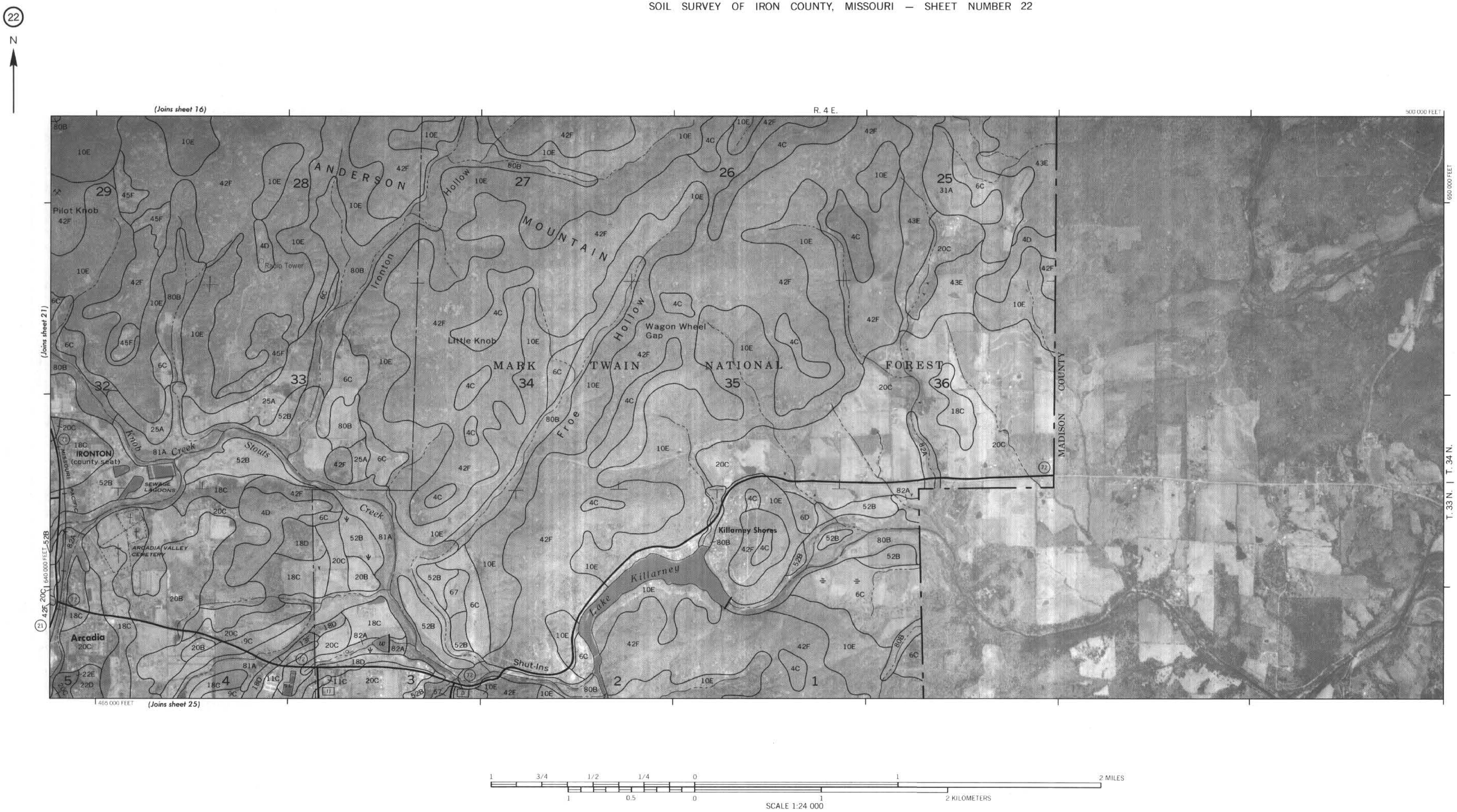

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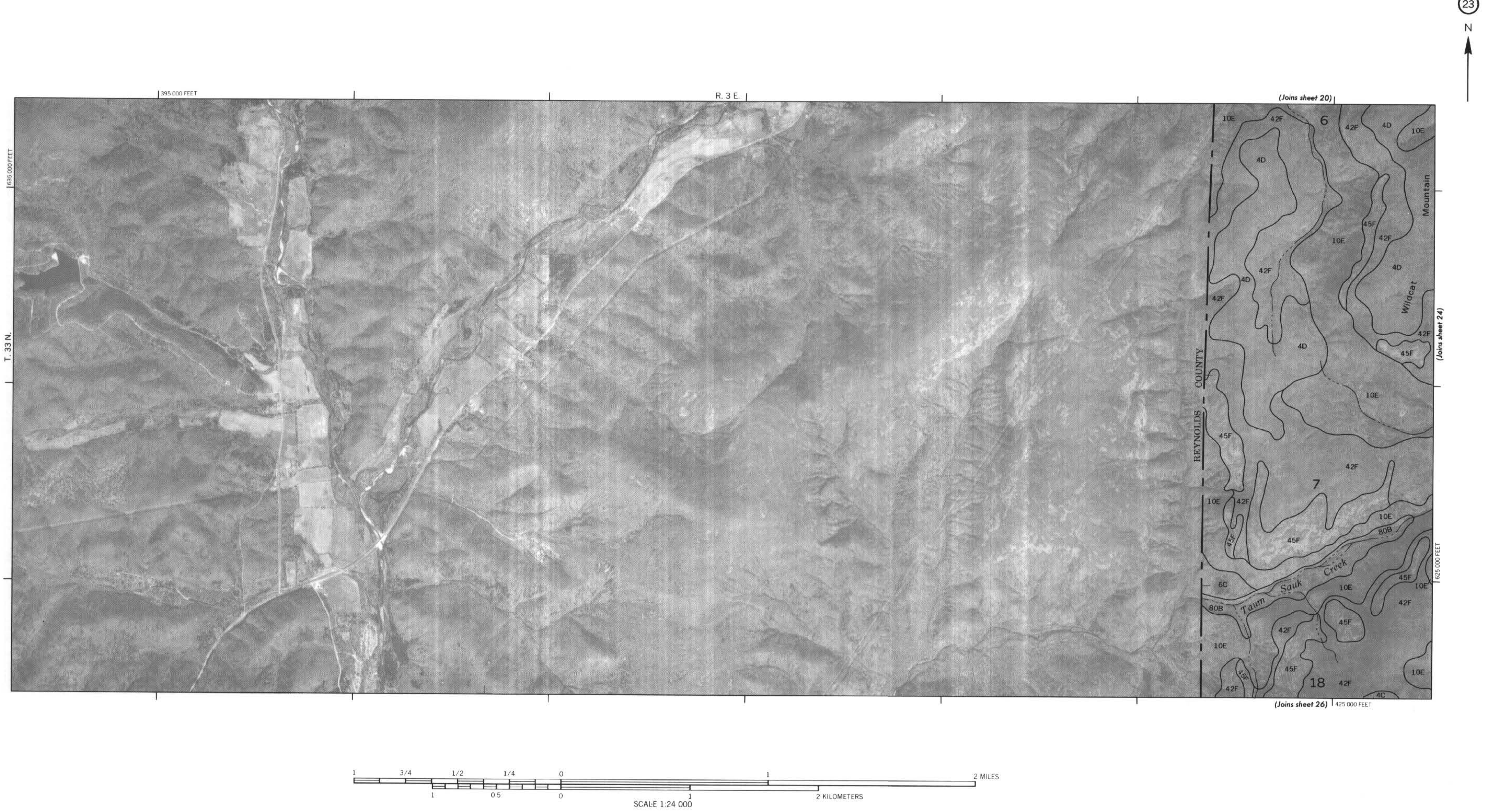

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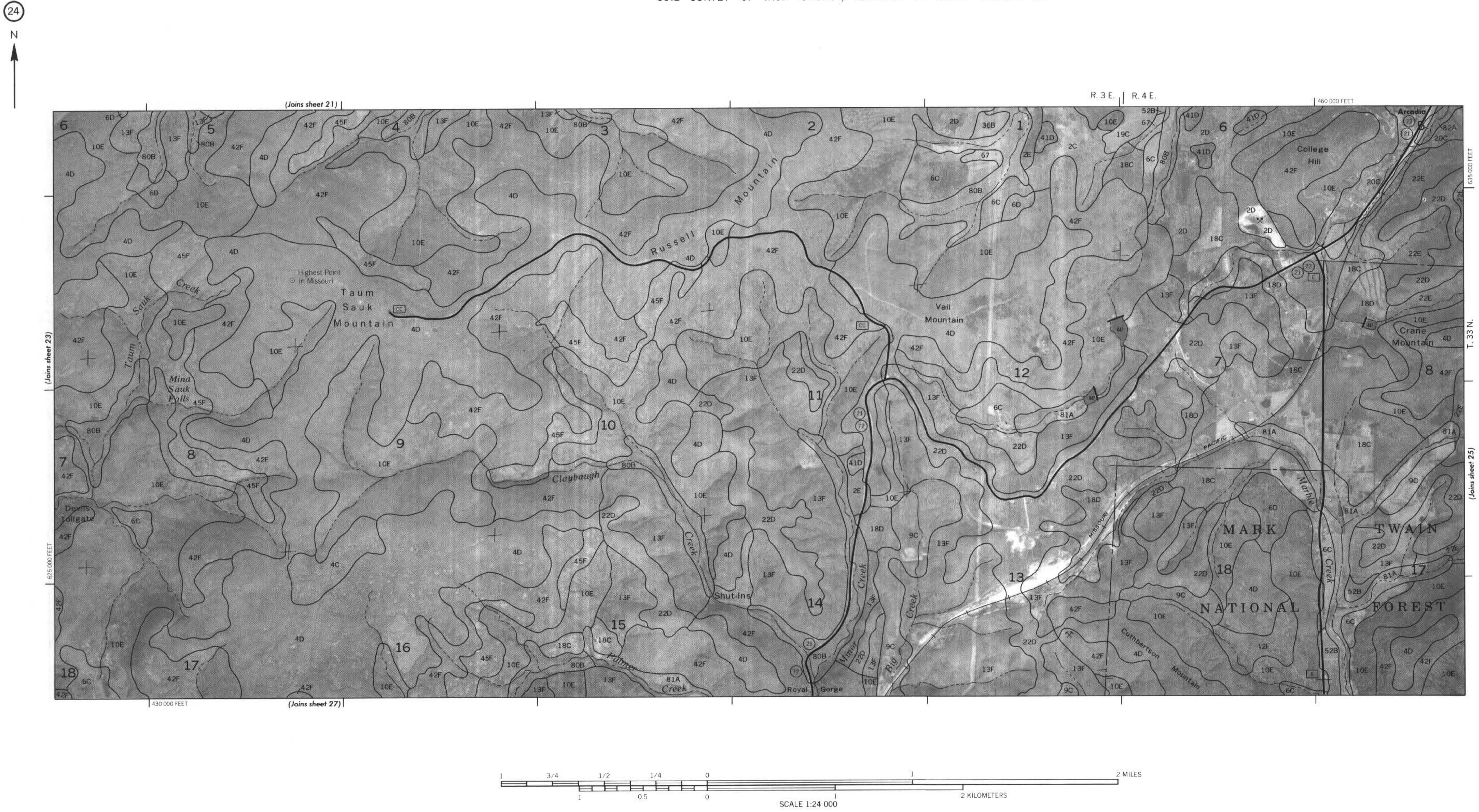

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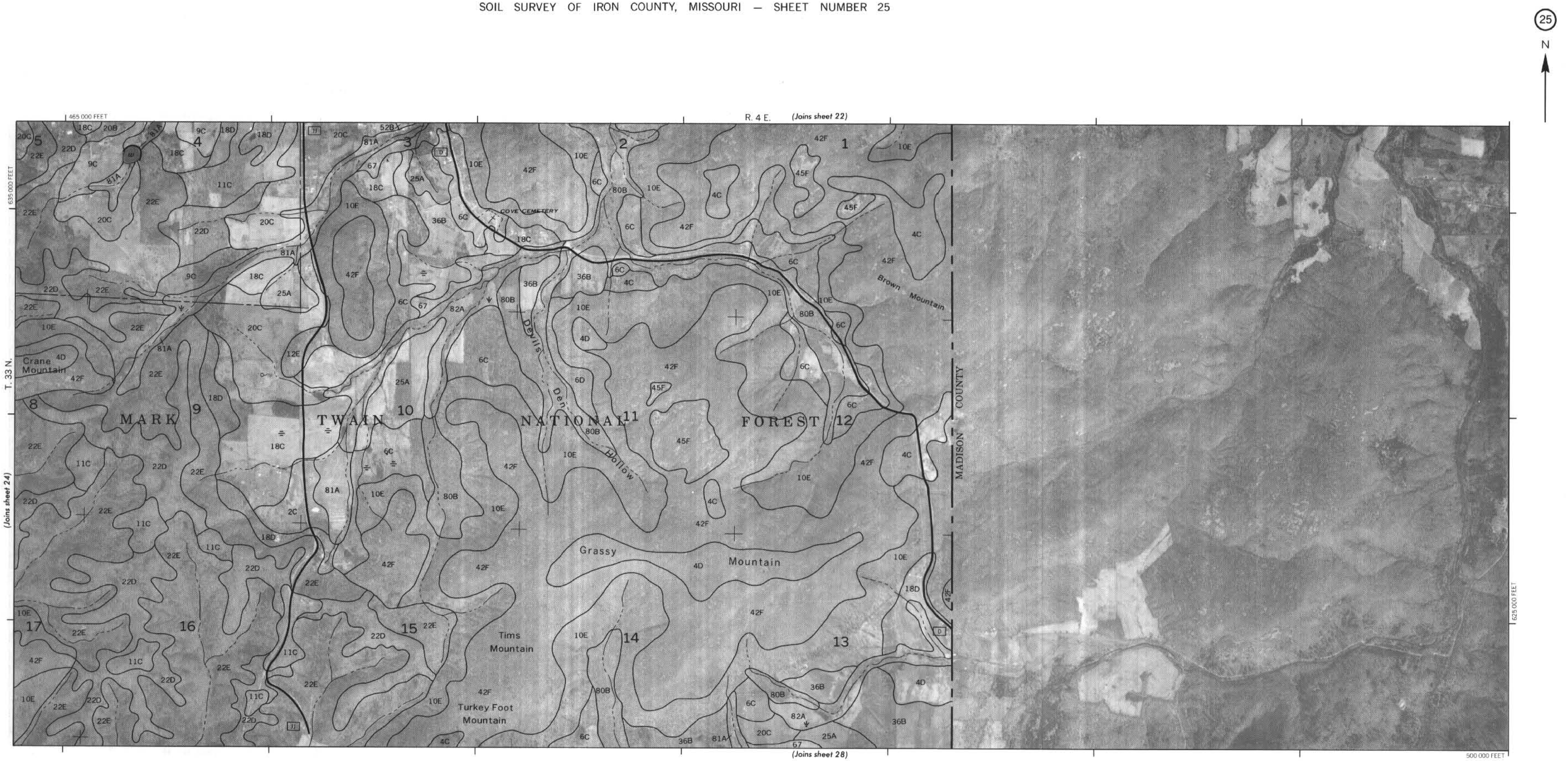

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1 0.5 0 1 2 KILOMETERS

SCALE 1:24 000

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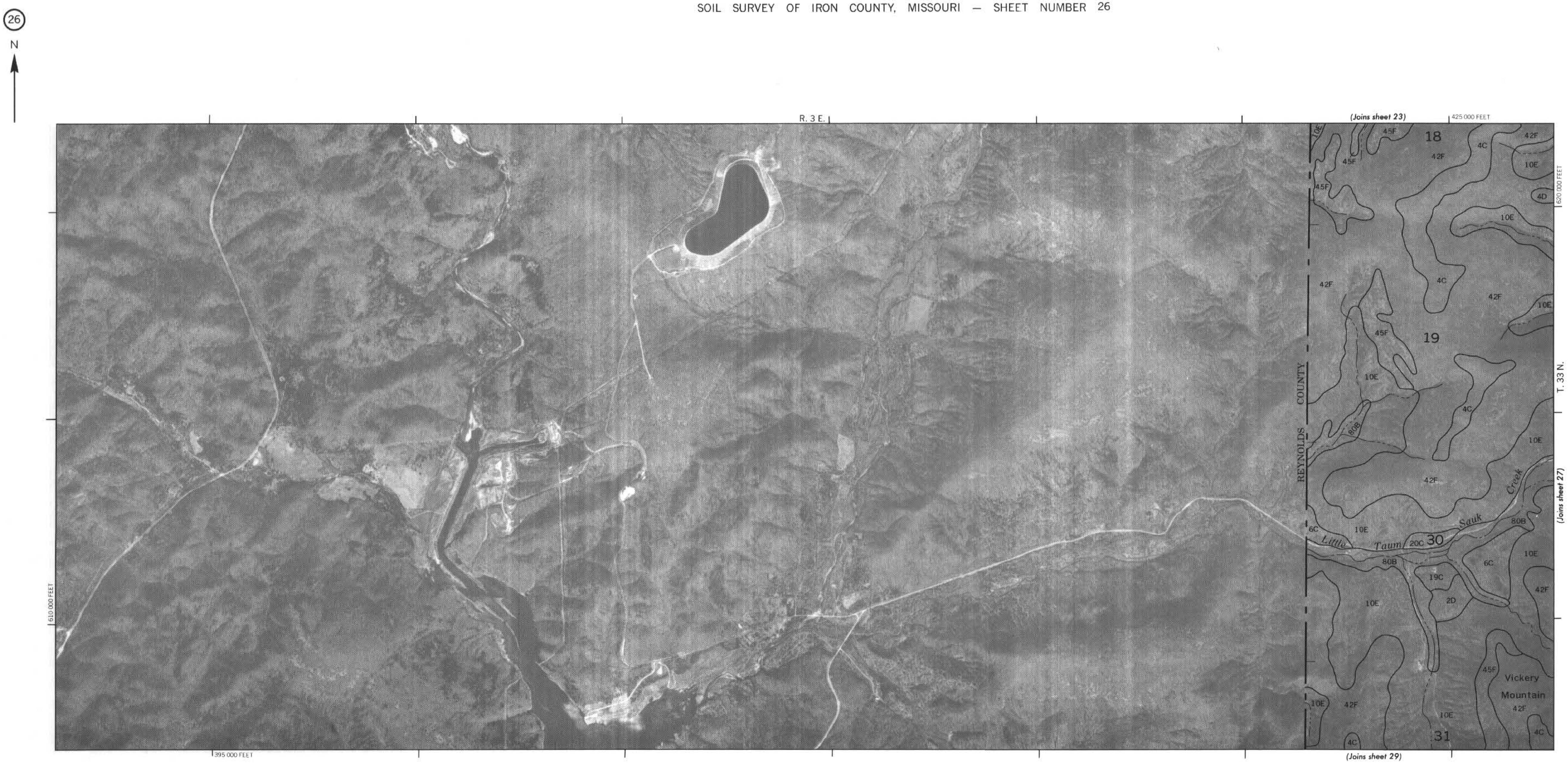

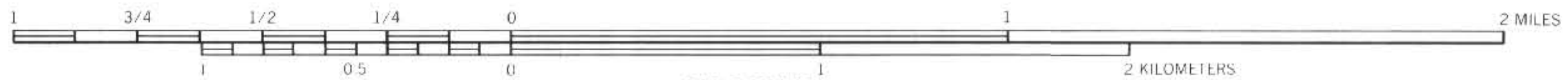

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SOIL SURVEY OF IRON COUNTY, MISSOURI — SHEET NUMBER 27

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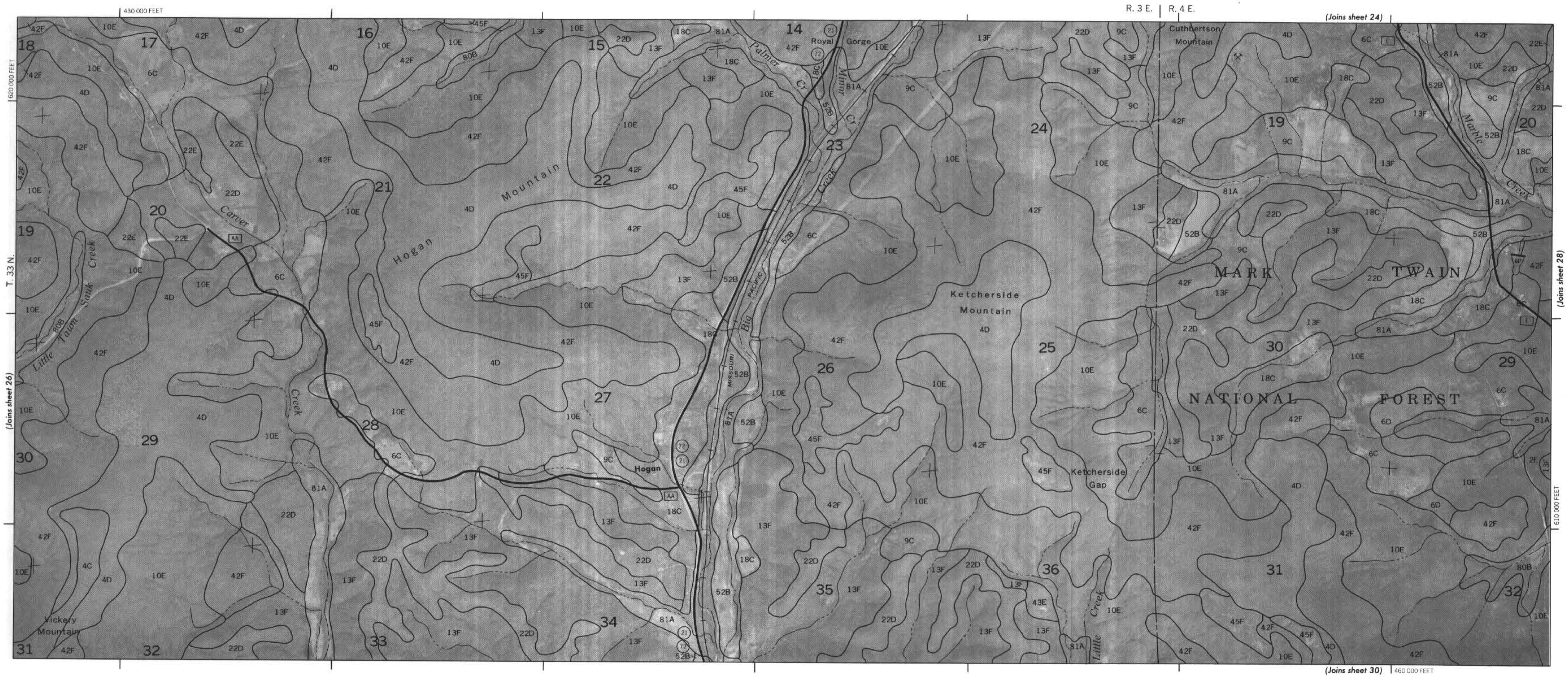

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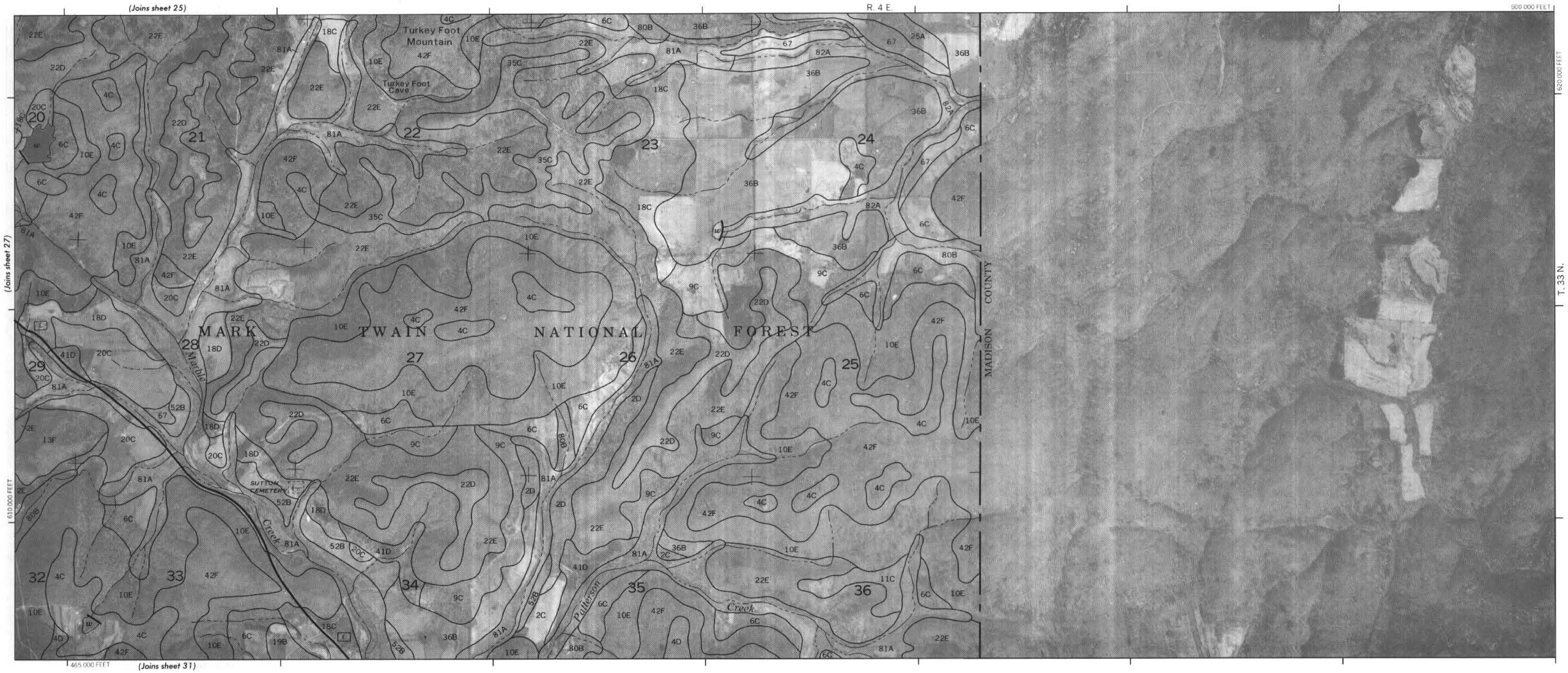
SOIL SURVEY OF IRON COUNTY, MISSOURI — SHEET NUMBER 28



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SCALE 1:24 000

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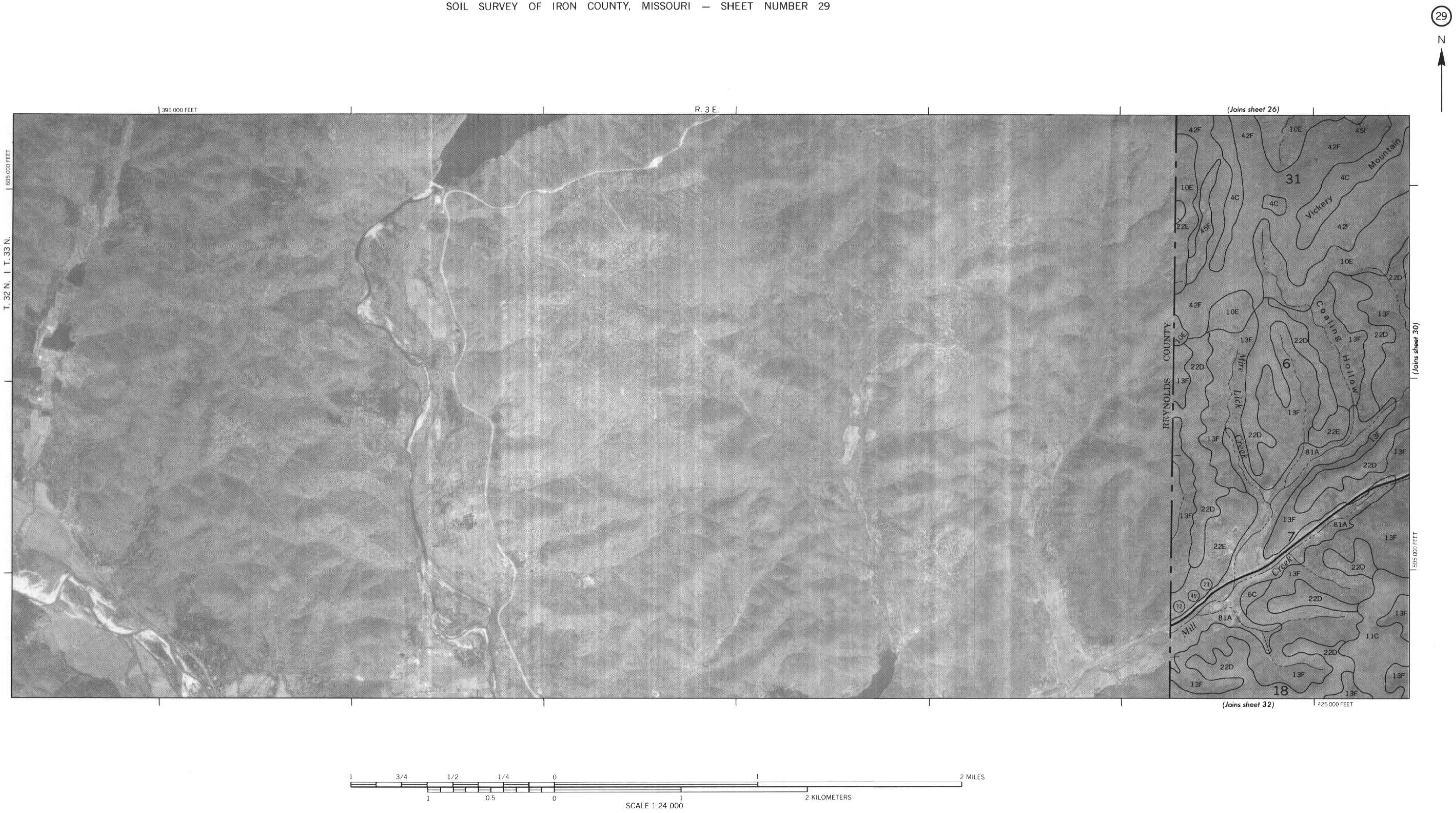
SOIL SURVEY OF IRON COUNTY, MISSOURI — SHEET NUMBER 29



SOIL SURVEY OF IRON COUNTY, MISSOURI — SHEET NUMBER 30

SOIL SURVEY OF IRON COUNTY, MISSOURI — SHEET NUMBER 31

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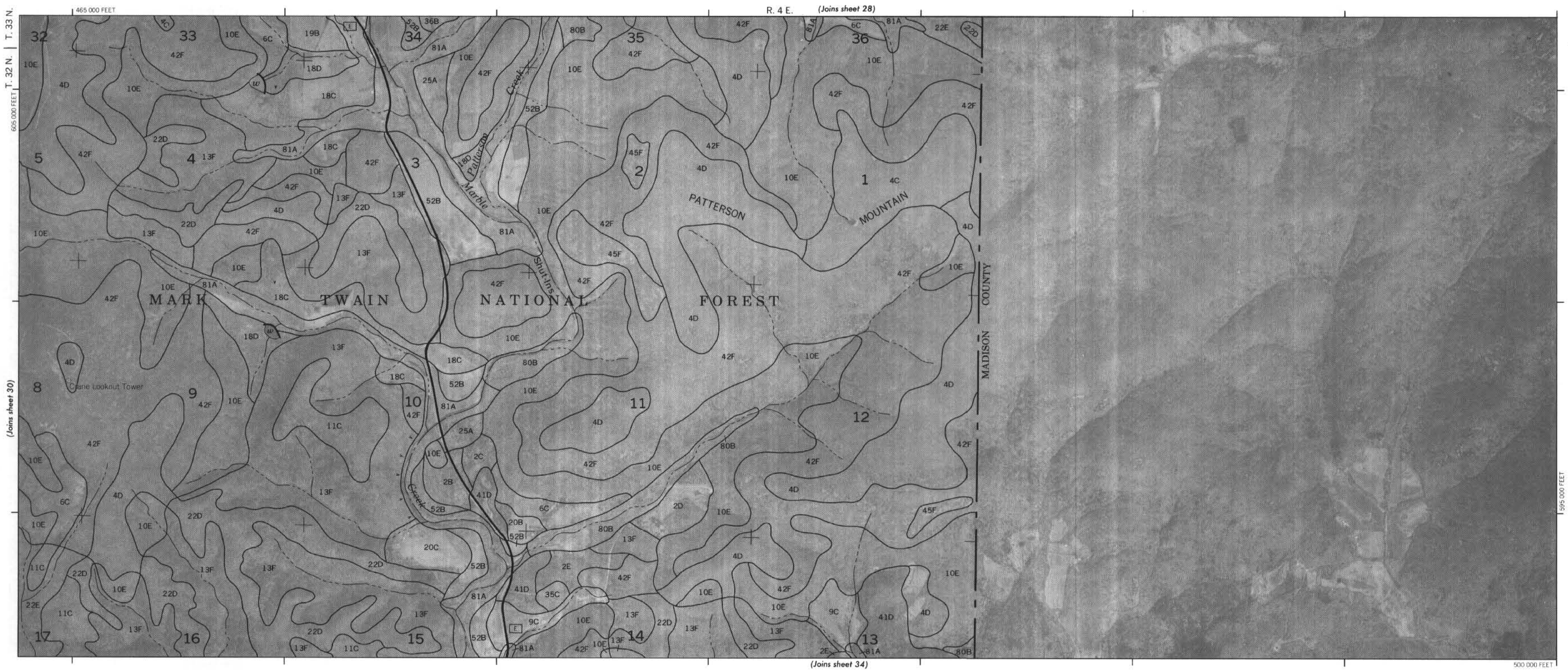

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SOIL SURVEY OF IRON COUNTY, MISSOURI — SHEET NUMBER 32

32

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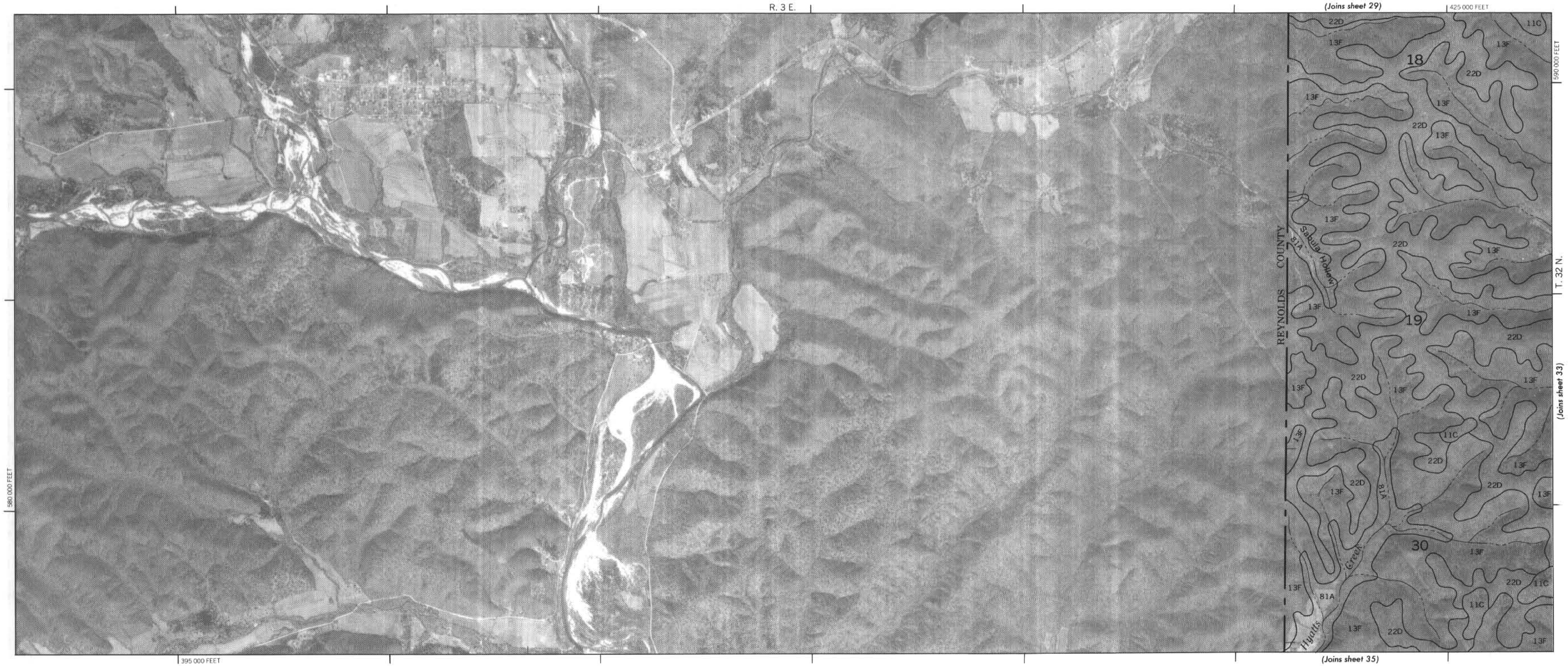

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SOIL SURVEY OF IRON COUNTY, MISSOURI — SHEET NUMBER 33

33

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1 3/4 1/2 1/4 0 1 2 MILES

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SCALE 1:24 000

34

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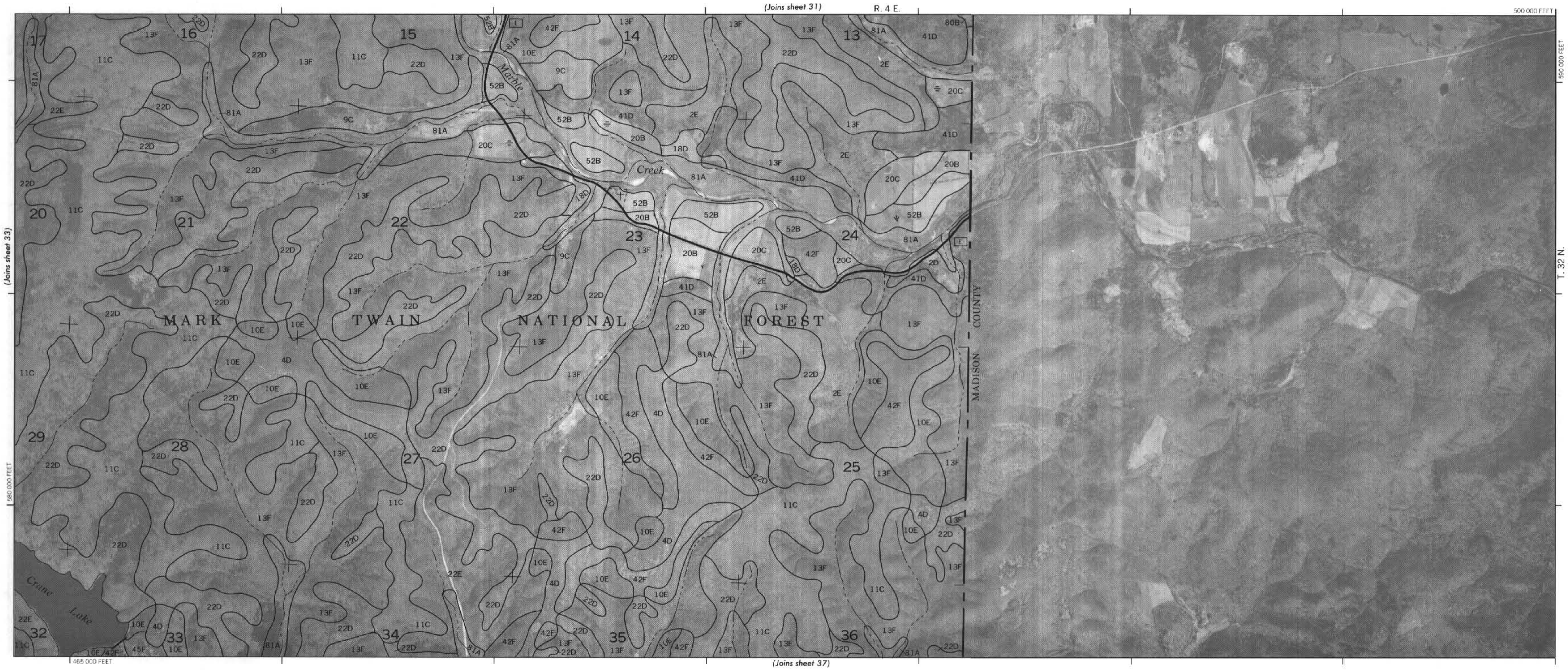
SOIL SURVEY OF IRON COUNTY, MISSOURI — SHEET NUMBER 34



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SOIL SURVEY OF IRON COUNTY, MISSOURI — SHEET NUMBER 35

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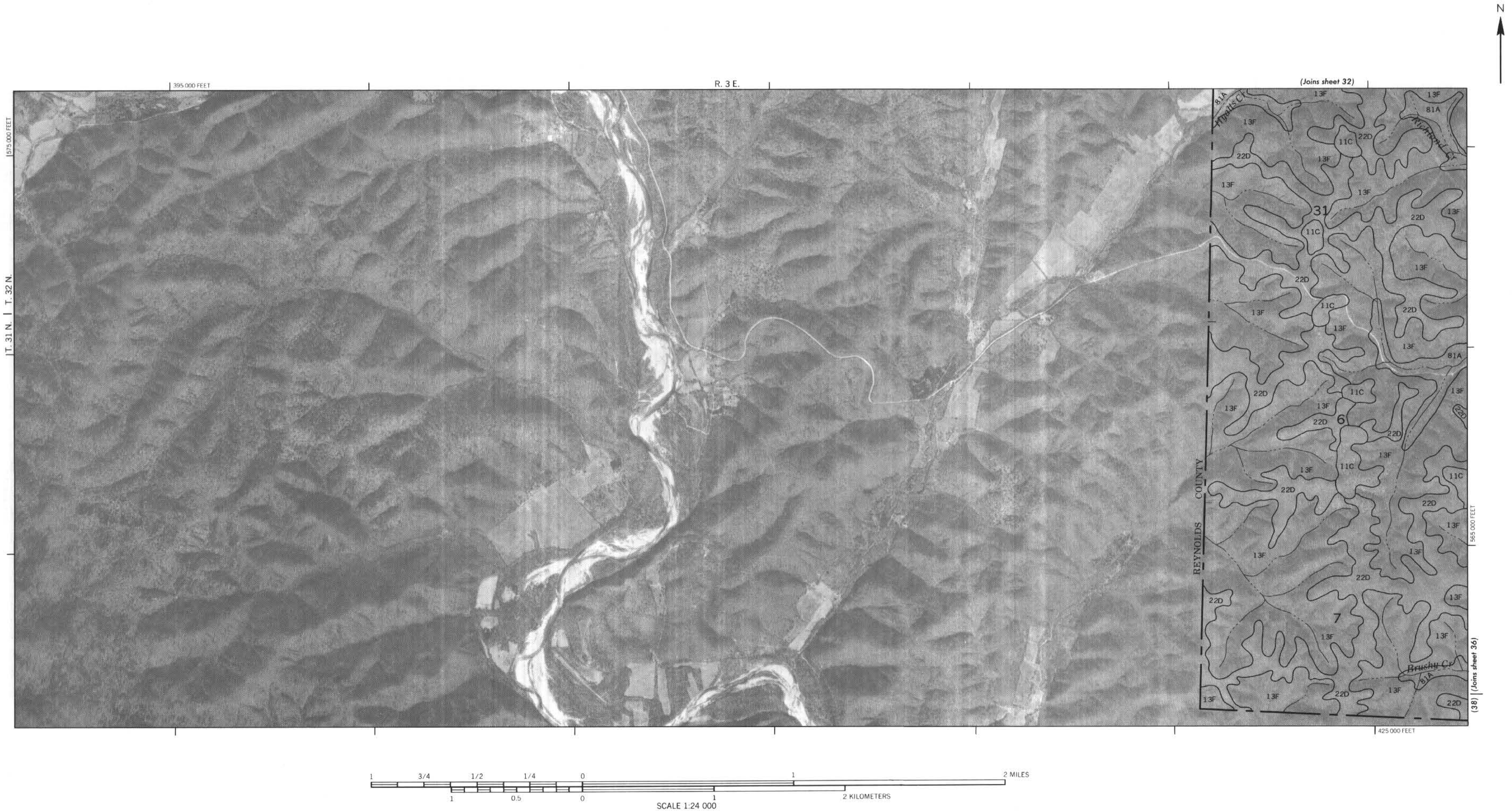

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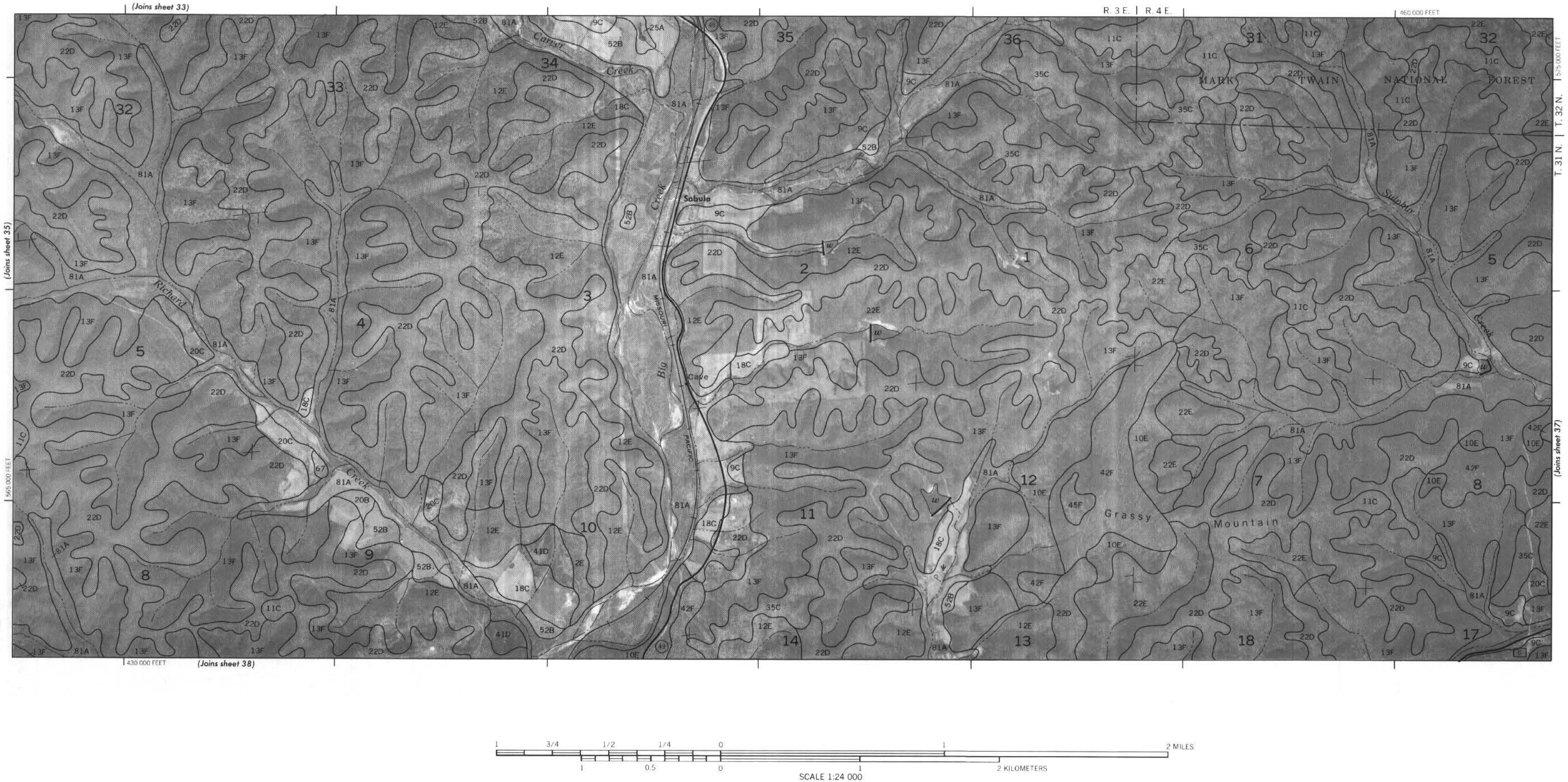

SOIL SURVEY OF IRON COUNTY, MISSOURI — SHEET NUMBER 37

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SOIL SURVEY OF IRON COUNTY, MISSOURI — SHEET NUMBER 38

SCALE 1:24 000

SOIL SURVEY OF IRON COUNTY, MISSOURI — SHEET NUMBER 39

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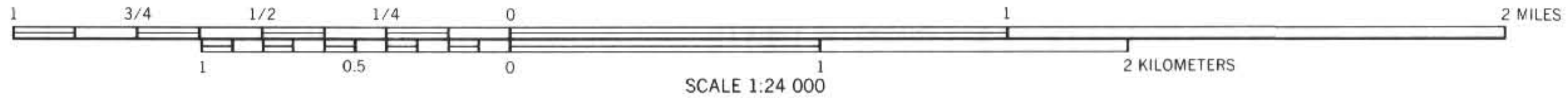
SOIL SURVEY OF IRON COUNTY, MISSOURI — SHEET NUMBER 40

SCALE 1:24 000

SOIL SURVEY OF IRON COUNTY, MISSOURI — SHEET NUMBER 41



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SOIL SURVEY OF IRON COUNTY, MISSOURI — SHEET NUMBER 43